

# MOVERS and SHAKERS

THE DEFINITIVE GUIDE TO LEADERSHIP IN GLOBAL ELECTRONICS 2007

- People page 14
- Places page 34
- Ideas page 48
- Technology page 56

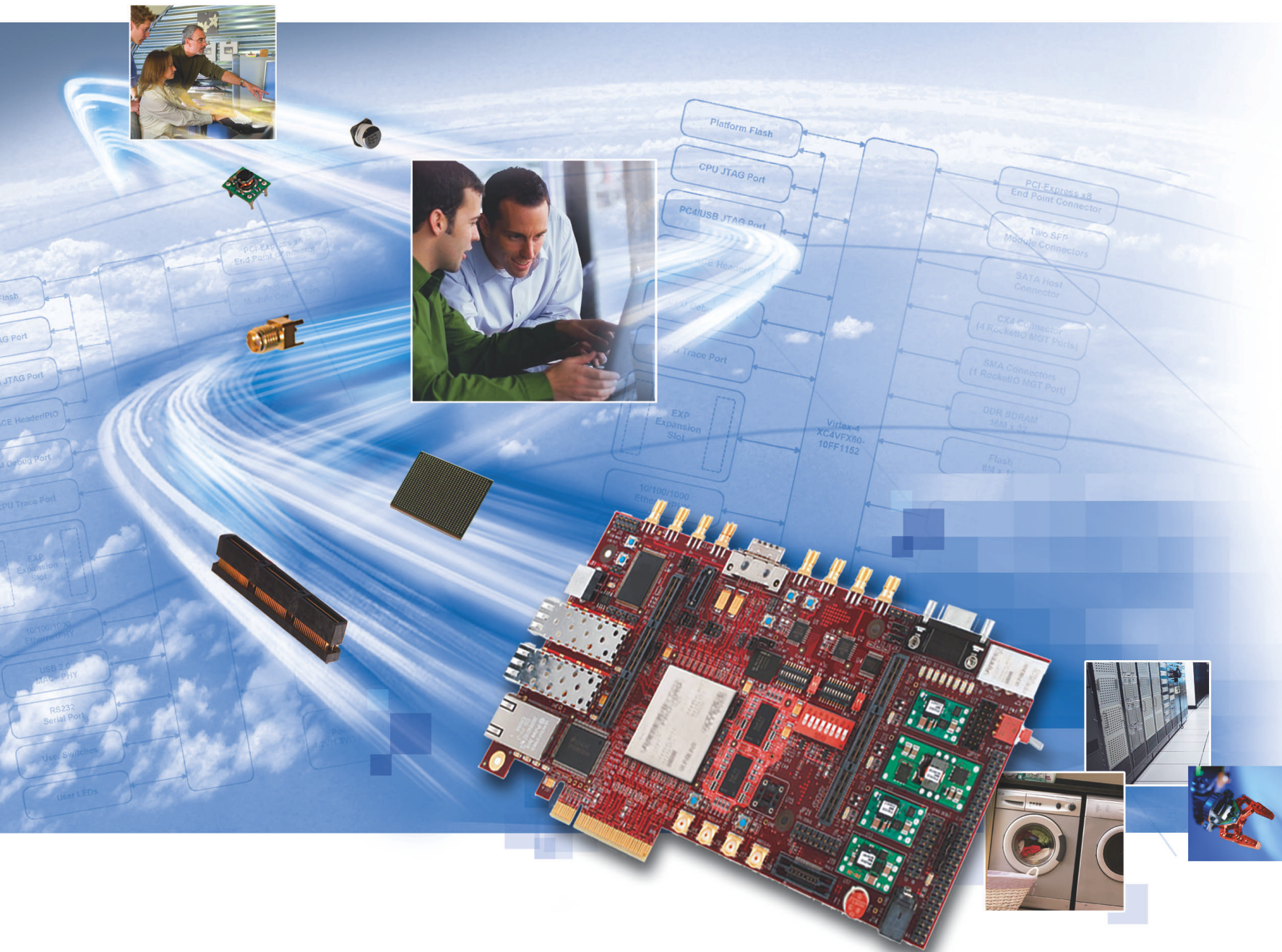
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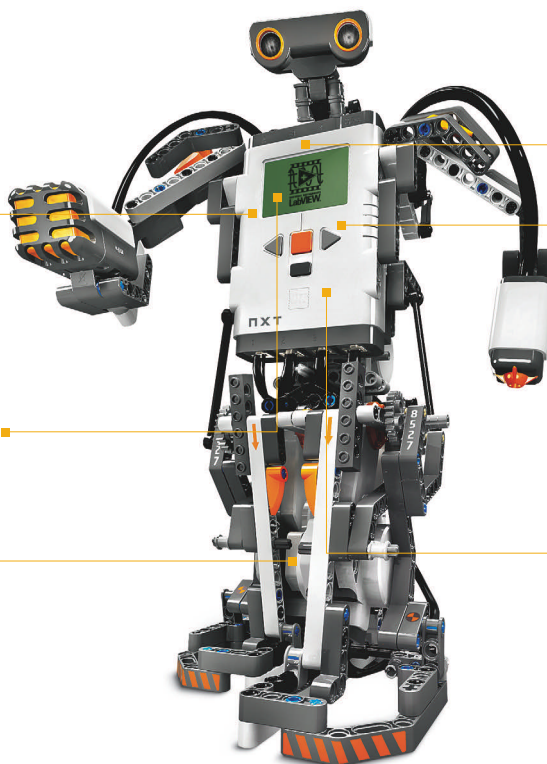
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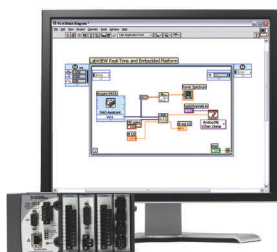
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# MOVERS and SHAKERS

THE DEFINITIVE GUIDE TO LEADERSHIP IN GLOBAL ELECTRONICS 2007

## Departments

8 Editorial

10 Economic Outlook

## The best and the brightest

We've profiled 15 CEOs who the editors have anointed the Movers and Shakers in the electronics industry. These CEOs share their successes, challenges, and visions for their companies and for the industry.

14 Jerry Fishman, President/CEO,  
Analog Devices Inc

15 John Daane, CEO, Altera

16 Michael Splinter, President/CEO,  
Applied Materials

18 Roy Vallee, CEO/Chairman,  
Avnet Inc

20 Scott McGregor, CEO,  
Broadcom Corp

21 Chia Song Hwee, CEO,  
Chartered Semiconductor

22 TJ Rodgers, President/CEO,  
Cypress Semiconductor

24 Bernard Meyerson, VP and  
Chief Technologist, Technology  
Group, IBM

26 Alex Lidow, CEO,  
International Rectifier

27 Lothar Maier, CEO,  
Linear Technology

28 Walden Rhines, CEO,  
Mentor Graphics Corp

30 James Truchard, President/CEO,  
National Instruments Corp



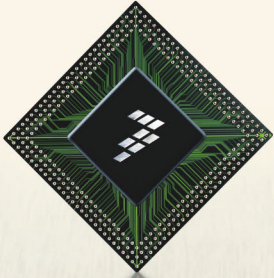
On the cover, back row, left to right: Brian Halla, National Semiconductor; Bernard Meyerson, IBM; John Daane, Altera; Roy Vallee, Avnet Inc; front row, left to right: Walden Rhines, Mentor Graphics Corp; Lothar Maier, Linear Technology; and James Truchard, National Instruments Corp

31 Brian Halla, CEO,  
National Semiconductor

32 Eli Harari, Founder/Chairman/CEO,  
SanDisk

33 Rich Templeton, President/CEO,  
Texas Instruments





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THE DEFINITIVE GUIDE TO LEADERSHIP IN GLOBAL ELECTRONICS 2007

## TABLE OF CONTENTS

### Places

#### 34 China

Innovation drives change in electronics market

#### 36 Profile

Actions Semiconductor—from start-up to first place

#### 37 India

Electronics industry's attraction to India grows

#### 40 Eastern/Central Europe

Manufacturing boom shows New Europe's strength

#### 41 Middle East

The Persian Gulf's other side: booming demand, development

#### 42 Western Europe

Region's semi landscape drastically changed

#### 44 Japan

Hot companies hone in on targeted markets

#### 45 Profile

Elpida transforms its DRAM business

#### 46 Nintendo executives

Wii are here to play



### The brightest ideas in electronics

- 48 Seven top executives from leading electronics companies open up on a variety of issues.

### Technology

#### 56 MIMO

Apple TV moves video using 802.11n Wi-Fi

#### 57 Power

Lithium-ion-battery technology revives electric car

#### 58 Medical Electronics

Telemedical electronics pave way for personal medicine

#### 60 Emerging Markets

Emerging-country markets shake tech's assumptions

#### 61 Analog

Appliances saving energy as population grows

#### 62 Consumer Electronics

Windows Vista: ambiguous bounty for hardware providers

#### 63 Standards

Standards for telecom finally come to fruition

#### 64 EDA

EDA addresses power dilemma in handhelds



## Online [www.edn.com/moversandshakers](http://www.edn.com/moversandshakers)

### Behind the scenes of Movers and Shakers



Editor in Chief Ed Sperling gives readers a behind-the-scenes glimpse into the makings of Movers and Shakers in this video. Learn how the editors

selected the various "movers" featured in this special annual supplement—whether the mover is a CEO, a country or region, or a technology. Go to [www.edn.com/moversandshakers](http://www.edn.com/moversandshakers).



### More bright ideas from industry leaders

If you found our CEO round table in this issue interesting, then go to [www.edn.com/moversandshakers](http://www.edn.com/moversandshakers) for more insightful conversation from the same electronics leaders.

### Exclusive online company profile: Qimonda

Qimonda is a company in Western Europe that has gone through a transformation in the past year—notably, spinning off from Infineon. Now, the liberated memory unit is showing what it can do—and the results are impressive. Read an exclusive online profile of Qimonda at [www.edn.com/moversandshakers/qimonda](http://www.edn.com/moversandshakers/qimonda).



# What makes a winner?

By Ed Sperling

**W**ho wins and who loses in the global electronics industry is no longer just a matter of hard work, good timing and luck. It's also a question of picking the right partners, making tough choices—ones that may not be intuitive at any moment—and being willing to defend those choices to a board of directors that may be clamoring for short-term gain instead of long-term growth.

Investors and analysts can be a very persuasive bunch, particularly when they're hurling threats at a CEO and CFO and filing class-action lawsuits directly against the executives. Sometimes these outsiders are right.

Sometimes they're not. These, after all, are the same people who called for the breakup of IBM in the early 1990s. It was only by ignoring the high-volume and plentiful advice that Lou Gerstner was able to execute one of the greatest turnarounds in business.

This year's choices for *Movers and Shakers* reflect that same kind of intelligent grit—the willingness to stand up for what's right for a company, and damn the torpedoes. Not all of the companies are at the top of their game at the moment, but all of the executives selected by the top editors of *Electronic News*, *Electronic Business* and *EDN* are showing the right kind of spirit and making the right kinds of moves that are necessary to navigate a complex and cyclical business.

We have brought back the roundtable discussion this year, after a two-year hiatus, because we wanted to hear what the leaders had to say not only to us, but to each other. One point that deserves note is the distinction between research and development. While R&D may be a single line item in

financial statements, research and development are very distinct departments with different missions and mindsets. The benefits of true research can be measured in years, sometimes decades. The benefits of development show up in less than two years.

Those who make the tough choices to invest at times when their directors and investors are clamoring for profits are true leaders. Those governments that make those choices possible are true leaders, as well. In this year's issue, we also look at the places that are making these kinds of choices easier—places where stock options are not dirty words, immigration for qualified workers is encouraged, and tax laws are written to attract businesses rather than push them away.

Getting this equation right is more than just giveaways, though. The recent abandonment of the Crolles Alliance by NXP (formerly Philips Semiconductor) and Freescale Semiconductor is a case in point. On the flip side, the explosion of manufacturing in Eastern Europe and the massive building underway in the United Arab Emirates warrant a serious look, given the amount of business heading there.

We also have taken a serious look at the technologies that have made it big, or which will make it big, driving markets of their own after years of deep research and continuous development. Batteries will change the cars we drive. Communications will alter medicine. Standards will change communications. All of these, taken together, will alter the world we live in and products that consumers buy.

In the electronics industry, people, places, technology and ideas are the four core elements. Check out our assessment of who and what are really driving the industry.

Finally, we encourage you to log onto our Web site, [www.edn.com/moversandshakers](http://www.edn.com/moversandshakers), to check out all of this information and more. This is your industry. The more you know, the better prepared you are to face the future.




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*Ed Sperling is the editor in chief of Electronic News and Electronic Business.*





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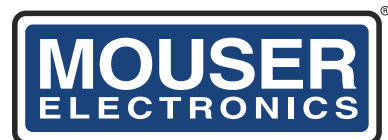
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# Global Outlook: What will grow, how much, and how fast?

By James Haughey

**W**orld economic growth has gradually slowed from average-plus to average over the last year, and it will slow further to average-minus over the next year. The prediction is for worldwide GDP



Jim Haughey

(gross-domestic-product) growth to slow from an estimated 3.6% in 2006, the highest in six years, to 3% this year and recover to 3.2% in 2008. So far, the slowdown has been primarily in North America, but, looking ahead, the slowdown

in growth will be more significant in Europe and Asia, with North American growth recovering partially from the slow economic growth in mid-2006.

The impact on electronics markets initially has meant slower sales growth for consumer products with little impact on capital-goods sales. Later this year and early in 2008, the impact of slower economic growth will reach capital spending. But with economic growth near average, capital spending will continue to expand more quickly than consumer spending through 2008. Slower economic growth will reduce inflation. This factor will be significant for purchases with a relatively large commodity and a relatively small manufacturing content. The inflation slowdown will be marginal for purchases with a relatively large manufacturing content because commodity prices fall much more steeply than wage cost when product demand slows.

## Growth by region

North American GDP growth will slow from 3.4% last year to 2.5% this year and recover to 3.1% next year. Mexican GDP growth is expected to plunge from 4.5% last year to only 1.5% this year as oil prices sink much lower and domestic social troubles restrain foreign investment. The recent appreciation of the peso also will reverse, making Mexican sourcing more attractive this year. North of the border, Canadian GDP will follow the same path as in the United States. The recent weakening of the Canadian dollar is expected to hold through 2008, making Canadian sourcing more attractive. Euro-zone economic growth jumped to an unsustainably high 2.6% last year but is forecast to slip to less than 2% in 2007 and probably 2008. Policy actions to raise credit costs have set this process in place.

Asian GDP growth, meanwhile, will drop from 4.7% last year to about 4% in both 2007 and 2008. Japan will contribute the most to the slowdown, with GDP growth falling from nearly 3% to approximately 2%. Similar to the situation in Europe, tighter credit has initiated the slowdown. Growth slowdowns in Japan and Europe are no longer the same process as in the United States. They began later and so will persist into 2008.

Elsewhere in Asia, growth will slow marginally in China, India, and the other manufacturing-export-driven economies due to slower growth in export sales to Europe and North America.

South America and Eastern Europe also will experience weaker growth in 2007. The slowdown will be marginal in Eastern Europe, where the only negative is restrained exports in a slower growth world economy. Growth will

dip as much as one percentage point in South America, which will be beset by both slower export growth and much weaker commodity prices. The poorer developing countries, which have recently become significant end markets for entry-level consumer electronics, will experience little, if any, slowdown in their 5 to 8% GDP growth rates in 2007. Countries very dependent on oil or minerals exports are an exception. Falling electronic-product prices will cause electronics sales to rise much faster than GDP. Generally, these countries have much improved foreign-exchange reserves after several years of above average export-commodity demand and prices, so there is little risk of the import quotas and tariffs that have disrupted sales to these countries in the past.

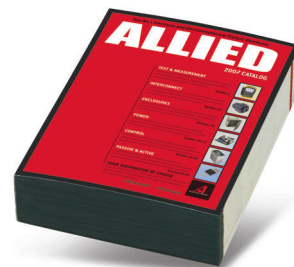
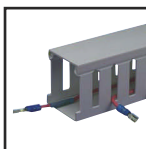
China will account for 25% of all world GDP growth in 2007. Small changes in Chinese import demand quickly spread worldwide. Unfortunately, the Chinese economic-accounting system is not yet fully separate from China's socialist past. China reports an approximate 10% annual growth rate every quarter before industrial counties have enough time to make their quarterly GDP estimates. As a result, there will be no warning of changes in Chinese economic trends.

China is trying to restrain spending to prevent an acceleration of inflation. Electronics production and imports are largely exempt from these efforts. Real estate, cars, and industrial-materials factories are the key targets. But there is a small risk that China will too heavily handle the restraints, causing a deeper world economic slowdown this year.

---

*Jim Haughey is Director of Economics for Reed Business Information.*





starting on page 294

starting on page 498

starting on page 511

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## Group Publisher

Alan Robinson

## Editorial Director

Maury Wright

## Editor in Chief

Ed Sperling

## Editor in Chief, EDN.com

Matthew Miller

## Executive Editor

Debra Bulkeley

## Managing Editor

Kasey Clark

## Group Creative Director

Norm Graf

## Senior Art Director

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## Associate Art Director

Melissa Motta

## Senior Associate Editor

Fran Granville

## Production Manager

Kelly Jones

## Staff Writers

Margery Conner

Robert Cravotta

Suzanne Deffree

Brian Dipert

James Haughey

Ann Steffora Mutschler

Paul Rako

Mike Santarini

Kenji Tsuda

Warren Webb

Ron Wilson

## Contributing Writers

Chitra Giridhar

Tam Harbert

Barbara Jorgensen

John Mason

Dennis Normile

Colleen Taylor

Amy Wang

Drew Wilson

## MOVERS AND SHAKERS BUSINESS STAFF

### Group Publisher

Alan Robinson, aarobinson@reedbusiness.com; 1-408-345-4450; fax: 1-408-345-4400

### Office Manager

Rose Murphy, MurphyS@reedbusiness.com; 1-781-734-8457; fax: 1-303-265-3212

### National Sales Manager

Barbara Couchois

barbara.couchois@reedbusiness.com

1-781-734-8405, fax: 1-303-265-2706

### Northern CA/Silicon Valley

Meg Bingley, meg.bingley@reedbusiness.com

1-408-345-4439, fax: 1-408-345-4400

### Pacific Northwest/Northern CA/ID/NV/ OR/WA/Western Canada

Judy Hayes, judy.hayes@reedbusiness.com

1-408-345-4437, fax: 1-408-345-4000

### Midatlantic/Midwest/DE/GA/IA/IL/IN/KS/KY/ MD/MI/MN/NC/ND/NE/OH/SC/SD/TN/VA/WI/ WV/Eastern Canada (Ontario, Quebec)

Jim Dempsey, jim.dempsey@reedbusiness.com

1-440-333-3040, fax: 1-440-333-3044

### New England/CT/MA/ME/NH/NJ/NY/PA/RI/VT

Joe McCabe, jmcabbe@reedbusiness.com

1-781-734-8433, fax: 1-303-265-3023

### Southwest/Southern CA/AZ/CO/MT/NM/UT/WY

Leah Vickers, lvickers@reedbusiness.com

1-562-598-9347, fax: 1-408-345-4400

### South Central/AL/AR/FL/LA/MO/MS/OK/TX

Roger Buckley, rbuckley@reedbusiness.com

1-972-216-5104, fax: 1-972-216-5105

### Internet Sales Director

Laura Lang-Dacus

laura.lang-dacus@reedbusiness.com

1-408-345-4476, fax: 1-408-345-4400

### Internet Sales Account Executive

Joyce Gilmore, joyce.gilmore@reedbusiness.com

1-781-734-8318, fax: 1-303-265-3175

### Advertising Service Coordinator

Nancy McDermott, nmcdermott@reedbusiness.com

1-781-734-8130, fax: 1-303-265-3014

### VP of International Sales

Mike Hancock, mike.hancock@rbp.co.uk

+44 208-652-8248, fax: +44 208-652-8249

### UK/Norway/Sweden/Denmark/Finland/ Netherlands/Belgium/Luxembourg

John Waddell, jwadds@compuserve.com

+44 208-312-4696, fax: +44 208-312-1078

### Austria/Germany

Adela Ploner, adela@ploner.de

+49 8131 366 99 20, fax: +49 8131 366 99 29

### Israel

Asa Talbar, talbar@inter.net.il

+972-3-5629565, fax: +972-3-5629567

### Italy

Roberto Laureri, media@laureriasociates.it

+39 02-236-2500, fax: +39 02-236-4411

### Switzerland

Gino Baretella, baretella@exportwerbung.ch

+41 1880-3545, fax: +41 1880-3546

### France/Portugal/Spain

Alain Faure, Alain.Faure@wanadoo.fr

+01 53 21 88 03, fax: +01 53 21 88 01

### Japan

Katsuya Watanabe, k.watanabe@reedbusiness.jp

+81 3-3402-0028, fax: +81 3-3402-0029

### South Korea

Chris Cho, chris.cho@rbi-asia.com

+822-6363-3039, fax: +822-6363-3034

### Singapore, Malaysia, Thailand

Peggy Thay, peggy.thay@rbi-asia.com

+65-6780-4511, fax: +65-6787-5550

### China

Maggie Gao, maggiegao@idg-rbi.com.cn

+86-10-6642 2262, fax: +86-10-6642 2242

### Taiwan

Grace Wu, grace.wu@rbi-asia.com

+886-2-2311-7906, fax: +886-2-2370-9799

### Hong Kong

Simon Lee, simonlee@rbi-asia.com.hk

+852 2965-1526

### Marketing Manager

Carol Betts, carol.betts@reedbusiness.com

1-408-345-4451

### Director of Custom Publishing

Cindy Fitzpatrick, cfitzpatrick@reedbusiness.com

1-781-734-8438, fax: 1-303-265-3035

### Editorial/Web Production Manager

Diane Malone, dmalone@reedbusiness.com

1-781-734-8445, fax: 1-303-265-3024

### Administration

Norm Graf, Creative Director

Dorothy Buchholz, Group Production Director

### Research Director

Rhonda McGee, rmcgee@reedbusiness.com

1-781-734-8264, fax: 1-303-265-3009

### Circulation Manager

Jeff Rovner, jrovner@reedbusiness.com

1-303-470-4477

## REED BUSINESS INFORMATION

### Chief Executive Officer

Tad Smith

### Chief Financial Officer, Executive Vice President

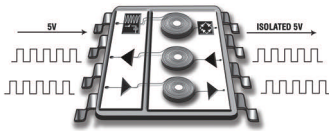
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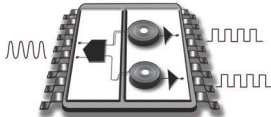


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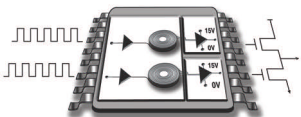
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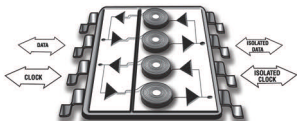
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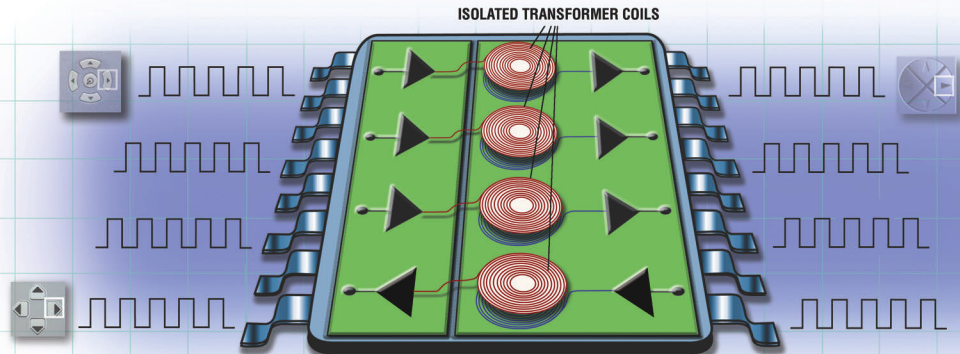
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# Analog Devices leadership rethinks priorities

After a tough couple of years, Analog Devices drops back and regroup.

By Tam Harbert

The last two years haven't exactly been the best of times for Analog Devices Inc. Growth in its core industry, analog, slowed from a rate of 20 to 30% in 2004 to 10 to 15% today. And the company's plans for increasing its DSP business failed, primarily because its play for the wireless-handset business in China stalled. As a result, revenues fell from \$2.63 billion in fiscal year 2004 to \$2.38 billion in 2005. Revenues rose last year, to \$2.57 billion, but still aren't back to previous levels.

Jerry Fishman, president and chief executive officer of the company, is no stranger to slowdowns, having guided the company through rough seas during the crisis of 2000 to 2001. Analysts give him credit for reading the tea leaves early and steeling the company for a rough ride. "They recognized the slowing opportunity before others in the industry" and have done a good job of cutting back on expenses, says Doug Freedman, principal and senior analyst at American Technology Research. Although he trimmed expenses in some areas, Fishman relied on the financial strength of the company—\$2 billion in cash—to continue spending in several key areas. "A lot of what happens in the future is based on what you do during the downturns," says Fishman. He continued spending on R&D, which he considers the lifeblood of the company. He has also continued to beef up the company's sales channels, particularly in Asia, and to hire applications engineers.

But Fishman and his management team also have re-evaluated some parts of ADI's strategy, including its DSP and power-management businesses.

In application-specific DSPs, the company had positioned itself to sell to second- and third-tier Chinese handset manufacturers, but that market never materialized. Instead, Tier 1 vendors, such as Nokia and Motorola, moved in to dominate handsets in China.

"Analog Devices' cellular operations took a hit because some of their Chinese customers didn't do well," notes Will Strauss, president of Forward Concepts. "He's regrouping on the DSP front but hasn't defined

**"A lot of what happens in the future is based on what you do during the downturns"**

—Jerry Fishman

an exact strategy yet. He sold the company's DSL-ASIC business because "the R&D costs were extremely high, there were a lot of competitors, and we had better places to spend the R&D." As for the rest of its DSP portfolio, "we're trying to resource the ones we're sure about and not resource the ones we're not, and that's still an ongoing process."

Yet, China could still become a good revenue source for the company if the Chinese government approves TD-SCDMA (time-division synchronous-code-division multiple access) as one of its 3G standards. "ADI seems to be in front of the crowd as far as the cell-phone chips for TD-SCDMA," notes Strauss.



**Jerry Fishman**  
President/  
Chief Executive Officer  
Analog Devices Inc

Another troublesome segment is power-management products for computers. Specifically, the company focused too heavily on desktop systems rather than the laptop units, and it lacked engineering expertise in this segment, Fishman says. ADI remains committed to this area, however. In surveys, its customers say they want to buy power-management devices from the company, says Fishman. "We just have to put the right products out there."

One bright spot for the company is in the consumer-electronics market, sales of which have risen from 13% of revenue in 2004 to 17% in 2006. The company supplies the MEMS (micro-electromechanical-systems) device that provides three-axis motion sensing in Nintendo's Wii game controllers. For Fishman, the Wii is a prime example of the ongoing strength of ADI: its focus on inventing core technology and then quickly developing it for new market opportunities as they evolve. "We invent core technology, and, very often, we're not quite sure where it's going to go," he says.

MEMS devices could find a substantial opportunity in gaming, says Freedman. "I think we'll see a similar technology transition, not just at Nintendo, but at Sony and at Microsoft," he predicts. "I think it's just a matter of time before all three of the game manufacturers adopt a similar technology."

*Tam Harbert is a free-lance journalist specializing in business, technology, and public policy.*



# Keeping pace with the industry

Altera's CEO sees growth ahead for programmable logic as the company continues its customer focus.

By Debra Bulkeley



**John Daane**  
Chief Executive Officer  
Altera

Few people would argue that the consumer is king in today's consumer-electronics world. In a market where the newest electronic gadget can be rendered obsolete in merely a couple of months, staying on top of what the customer wants is the order of every day.

For the technology suppliers to OEMs, the message is as clear: Hone in on what your customer wants. Altera, a leader in the PLD (programmable-logic-device) market, has drilled down even deeper to what their customers want by focusing on specific markets and delivering products that answer their customers' specialized needs. Add to that fact that Altera's core business—CPLDs (complex PLDs) and FPGAs (field-programmable gate arrays)—is becoming even more sophisticated and finding its way into hot applications, such as wireless products and multimedia systems, paying attention to customer needs is even more critical.

"We went from being a very insular company five to six years ago to really focusing on vertical applications and developing deep relationships with our customers," says Chief Executive Officer John Daane. "That was a cultural change for the company." The vertical markets Altera focuses on include the military, medical, broadcast equipment, wireless, and the staple: communications. No longer does Altera use the "horizontal, frontal-assault strategy," Daane adds.

In the notorious battle for market leadership with Xilinx, Altera's altered strategy has generally reaped

positive results. In 2006, company sales were \$1.29 billion, up 14%, compared with \$1.12 billion in 2005. Although new-product sales increased 150% last year, sales were soft in the fourth quarter. The company decreased its forecast of first-quarter revenue of 2007 to \$305 million from \$350 million.

Daane, a former design engineer who became chief executive officer in November 2000, is quick to point out that the company's philosophy

**"We went from being a very insular company five to six years ago to really focusing on vertical applications and developing deep relationships with our customers"**

—John Daane

overall is on course. "Our goal is to grow at least twice that as the overall semiconductor industry," he says. "We've grown at a compound annual rate of 16%. Generally, that [trend] should continue with the products we have, and we should continue to grow at two times the pace of the industry."

Semiconductor-research company iSuppli expects PLD revenue from consumer products to climb from \$354 million in 2005 to \$477 million in 2010. PLD revenue from wireless

communication will rise from \$260 million to \$396 million, iSuppli predicts. Gartner Dataquest predicts solid growth of 15.7% to resume in 2008 and forecasts the FPGA/PLD market to outperform semiconductors from 2008 onward.

Some of the San Jose, CA, company's growth will undoubtedly come from new products. Daane mentions the company's ambitious plans for several product introductions in 2007, including its high-end Stratix III FPGA devices, which the company will begin shipping during the third quarter, he says. In March, Altera announced its Cyclone III family, which it touts as the industry's first 65-nm, low-cost FPGA. Daane holds up Cyclone as an example of how the company has changed its strategy to fulfill customer demands. "The more you design into your product, the higher the cost. When we designed the Cyclone series, we did the opposite. We pulled features out; we designed a customer advisory board and figured out what the customers wanted," he says.

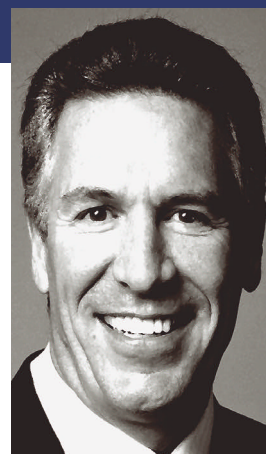
The Cyclone III FPGAs consume 75% less power than competing FPGAs. According to Altera, at 20% lower cost per logic element than the previous generation, the product line lets designers use FPGAs in more cost-sensitive applications than previously possible. The power issue, Daane says, has "really set us apart from the competition."

*Debra Bulkeley is executive editor at Electronic Business.*

# Applied's Splinter leads with insight

Choosing the right roads has been critical to Applied's success.

By Ann Steffora Mutschler



**Michael Splinter**  
President/  
Chief Executive Officer  
Applied Materials

Leading semiconductor-manufacturing-equipment supplier Applied Materials Inc debuted in 1967. It has since grown to \$9.2 billion in net sales for its fiscal year 2006, which ended Oct 29, 2006, which is 31% higher than \$6.99 billion for fiscal year 2005.

Intel Corp veteran Michael Splinter took over as chief executive officer in 2003 and quickly observed that one of the company's biggest challenges is navigating from the front of the pack. "There are no tail lights to follow," says Splinter. "You have to shine your headlights on the road ahead and try to determine where the company needs to go, what the structure of the company has to be to stay the leader. You don't want to get rear-ended in this business, so you've got to run faster than the competitors and you have to pick the forks in the road that you think are going to be right."

One of those choices for Applied is the solar-cell industry, which the company entered late last year. It solidified that decision in March by inking a deal with Moser Baer India Ltd to develop and install the first generation 8.5 thin-film-solar-module production line to help the company reach its goal of opening a factory that produces 200 MW per year.

From an industry perspective, Splinter is conscious of Applied's role in providing direction and leadership for other companies in the solar industry. "The kind of direction we are supplying here comes in several areas. It is easy to know that you've got to get the cost of producing a watt of solar electricity down. It's another thing to

have a road map to do it," he says.

"Applied Materials is not going to promise something that it can't do. In the end, the only thing that really matters in the solar area is the cost per watt. That's what is going to make the changeover happen. It has to be cost-effective. It has to give a payback. People aren't going to adopt [solar electricity] in large scale just because it's good for the envi-

**"People aren't going to adopt [solar electricity] in large scale just because it's good for the environment; it has to be good for the environment, and it has to be cost-effective."**

—Michael Splinter

ronment. It has to be good for the environment and it has to be cost-effective," Splinter says.

Applied is also creating a global infrastructure to enable R&D worldwide, Splinter says. This strategy fosters the innovation and culture of the company so that it can remain competitive and continue to attract and employ the best possible students and employees. "It all gets down to the people, the technology, and the products that you're going to sell to be able to compete on a worldwide basis," he says.

Market leaders such as Applied

also play a role in helping the United States maintain its technology leadership. The best way to do that, he says, is to continue to pursue innovation and to increase the size of the company. In addition, calling attention and helping to solve issues with doing business in the United States are also important. "Our company exports 85% of our product. Export-tax benefits have pretty much gone away. The United States has the second-highest business tax in the world. I think that the US government really has to think about the environment it is creating for US companies. You want to create more jobs and create more manufacturing jobs, in particular. We have to be on some kind of level playing field with the world."

Splinter isn't just talk: he serves on the Technology CEO Council, an elite group of nine top high-tech executives that helps drive new public policy. He is also a member of the Governors' Council of the World Economic Forum, which consists of influential and forward-thinking business, government, media, and intellectual leaders.

Leaders have their day in the sun, and, under Splinter's direction, Applied is no exception. This year, Corporate Responsibility Officer magazine ranked the company No. 12 on the list of the "100 Best Corporate Citizens" in the United States for 2007.

*Ann Steffora Mutschler is a senior editor at Electronic News and Electronic Business.*



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# Expanding in a single-digit growth industry

Avnet's Roy Vallee looks to smaller customers, the Web, and expansion to increase the top distributor's market share.

By Suzanne Deffree



**Roy Vallee**  
Chief Executive Officer/  
Chairman  
Avnet Inc

**A**vnet Inc may hold the spot as the world's largest distributor by revenue with \$3.89 billion in sales recorded for its December 2006 quarter, but it won't stay there by serving only other big companies. In a market whose participants celebrate growth in the single digits in the same way the other markets celebrate double- or even triple-digit growth, Avnet is looking to expand. "The rate of growth slowed as we exited calendar year 2006," says Roy Vallee, chief executive officer and chairman of Avnet, pointing to a more-than-\$300 billion industry. "Everyone is going to be looking for ways to outgrow the market in 2007."

One such approach is to look beyond Avnet's existing customer base of large companies. "An opportunity for Avnet is to focus more on smaller orders, smaller customers, and the power of the Web," Vallee says, pointing toward Avnet Express, the distributor's online-sales channel. "We're talking about NPI (new-product introduction); we used to call that R&D. There is some growing MRO (maintenance-and-repair-operation) opportunities, and then there are just smaller customers. While, in many cases, we can't have field-application engineers...physically face to face with those customers at the moment...that they want, we created this service offering where we have centralized telesales people, as well as a robust Web capability that allows these customers to be well-served pretty much any time of day."

The goal is to up Avnet's total market share as the market consoli-

dates by focusing on building relationships with smaller companies.

"We have the franchises, and we have the inventory. The inventory was more than 1.3 billion electronic components across a broad set of suppliers [by the fourth quarter of 2006]. ...If we can do a better job of making those resources available to a broader base of customers...we think that we can increase Avnet's share of the market," he says.

**"Avnet could add a lot of value to the supply chain in Japan, and we will be looking for ways to expand our role there."**

**—Roy Vallee**

Vallee also is looking to increase Avnet's reach across the globe through mergers and acquisitions, despite the company's presence in 70 countries. Indeed, Avnet acquired a number of companies in 2006, including GE's Access Distribution subsidiary in a deal worth \$412.5 million, and ESCO Italiana, one of the most successful distributors in Italy.

"We think about mergers and acquisitions as opportunities to extend our presence, as well as to consolidate the industry. We will continue to acquire when the acquisitions fit from a cultural, strategic, and economic perspective."

Vallee points to Asia/Pacific's

high growth rates. He also says that, although Avnet has a small presence in Japan and the rate of growth is not high there, the size of the market relative to the distributor's size is enormous. "Avnet could add a lot of value to the supply chain in Japan, and we will be looking for ways to expand our role there," Vallee says.

So how is 2007 shaping up for distribution? The answer depends on inventory. "Where 2006 started strong and finished a little weaker, 2007 is starting a little weaker but has the prospects of finishing strong," Vallee says. However, Vallee notes that the industry was at the tail end of an inventory correction at the end of 2006 and the beginning of 2007, which dampened the sale of components.

Still, the 30-year Avnet veteran would not venture anything but a general guess on 2008.

"Those of us who have been in the industry a long time have gotten accustomed to these fairly wild cycles in the semiconductor-supply chain. It would appear that that cyclical nature is permanently changed. I'm not saying that it has gone away, but it certainly seems as though the volatility has dampened. Based on the way the cycle appears today, it seems as though we could be in for many years of high-single-digit or low-double-digit growth rates without a major correction until there is some sort of global economic recession."

*Suzanne Deffree is news editor at Electronic News.*



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# Making all the right connections

Broadcom's Scott McGregor looks to "connect everything" in communications—and within his company.

By Suzanne Deffree



**Scott McGregor**  
Chief Executive Officer  
Broadcom Corp

Undisputedly, growth in the semiconductor industry is a good thing. And Broadcom Corp, a company that has consistently out paced overall industry growth since 1995, shines as an example of growth in both revenue and innovation.

The communications giant recorded 2006 revenues of \$3.67 billion, received its 2000th US patent in March, and has had more than 30 acquisitions since its 1998 initial public offering, adding numerous employees and business units to now claim a head count of approximately 5230 and more than 20 units among its 60 global locations.

Although a good thing, growth also can be a challenge. And, in Broadcom's situation, the challenge matches its tagline: "Connecting Everything." The Irvine, CA, company's technology strategy is to continue to develop semiconductors that connect different devices.

But Broadcom also has to connect its own internal businesses, a necessary and vital action for a company that aims to maintain its core competencies while continuing its growth. "Our strategy for growth ties in with that 'connection,'" says Broadcom Chief Executive Officer Scott McGregor. "Within our company, we have 20 some odd lines of business, each of which pursues a different aspect of the communications market, and we connect them in a number of ways."

McGregor, who moved in January 2005 from Philips Semiconductor to take the helm at Broadcom, points to central engineering, flat organization

structures, and a decentralized model that empowers each unit's general managers to drive their business.

"We also buy a lot of start-up companies," he says.

The company, a start-up itself in 1991, aimed to take on behemoths such as Intel Corp. Although it now stands shoulder to shoulder with Intel and the like, it strives to keep its start-up spirit 16 years later. "One of the ways to feel like a start-up is to have a lot of the people in the

**"The companies that will lead the future are the ones that can bring to bear a broad portfolio of technologies and communications."**

**—Scott McGregor**

company recently come from start-ups. We find that we compete for talent with start-up companies more than the more established companies [do]. That reflects both our innovation and our culture and allows us to create an environment where people who come from start-up companies like it here," McGregor says, claiming a high employee-retention rate when Broadcom acquires start-ups.

"We consider ourselves a large start-up—or perhaps a plethora of start-ups—and that's our strength. We keep it that way because it gives us the aggressiveness, the energy and

the passion to really do great products in the market," he says. A steady stream of acquisitions also keeps Broadcom's portfolio expanding, a big plus, according to McGregor, who expects the communications market to continue its high-growth and for the winners in the market to be the companies that can "connect everything" among these wired and wireless technologies.

"A lot of these technologies were relatively stagnant a number of years ago. Television went for decades without changing; now, suddenly, there are all of these display technologies," he says. "We now expect that devices in our home will communicate. There is a lot of excitement in the mobile area [in] new handheld devices. There's a lot going on in wireless connectivity and the ability to move video around. Lots of new content is becoming available. For me, these are catalysts of an industry that has a lot of growth ahead of it."

"One of the reasons we focus on communications in the broad sense is that we believe that not only is it an interesting market, but the winners are going to be the ones that can play across all the different facets of the market and bring it together. The ones that have great niche products? I'm afraid their days have passed," McGregor says. "The companies that will lead the future are the ones that can bring to bear a broad portfolio of technologies and communications."

*Suzanne Deffree is news editor at Electronic News.*



# Chartered Semiconductor: power in partnerships

The once-struggling foundry is now on the leading edge of process technology.

By Barbara Jorgensen



**Chia Song Hwee**  
Chief Executive Officer  
Chartered Semiconductor

It's unlikely the idiom "If you can't beat 'em, join 'em" was coined anywhere in the Far East, but Singapore-based Chartered Semiconductor Manufacturing Ltd has fully embraced the concept—to its benefit. The foundry's most recent financials were lackluster: In March, the company expected revenue for the first quarter of 2007 would decline approximately 5% from \$339.1 million in the fourth quarter of 2006. However, Chartered's long-term outlook is excellent, thanks to the powerful partnerships the company has forged.

Five years ago, Chartered was struggling, competitively lagging the market in process technology, and losing market share, says Chief Executive Officer Chia Song Hwee. "Chartered was mired in a position—whether they were last, I'm not certain—but they weren't even a fast follower," says Len Jelinek, principal analyst with iSuppli. "They were losing substantial ground in both technology and revenue."

"For us to close the gap, the only viable option was to partner with someone," says Chia. Although building and equipping a fab is expensive—analysts estimate a price tag of \$3 billion—process technology isn't cheap, either. At the 65-nm process node, development and ramping runs at approximately \$700 million to \$900 million; smaller geometries entail even higher costs. When Chartered was looking for a partner, IBM was looking for a foundry and a way to share development expenses. Chartered and IBM began an initial

collaboration in November 2002 to jointly develop advanced technology and provide cross-foundry manufacturing capacity to mutual customers. Samsung Semiconductor joined the initiative in March 2004.

By all accounts, the partnership is thriving. The resulting Common Platform Technology, developed with Samsung, is gaining traction across the electronics industry. Qualcomm signed on as a customer in 2006. The group will begin roll-

**"I think the key point in building—and keeping—a relationship together is that both partners are able to benefit."**

—Chia Song Hwee

ing out immersion lithography for 45-nm processes in the fourth quarter of 2007. IBM believes that this technology will carry silicon manufacturing to 22 nm and possibly beyond. But how has Chartered managed to maintain its interests amid heavy hitters, such as IBM and Samsung?

"Well, I will say it takes two hands to clap," says Chia of the initial alliance with IBM. Chartered knew it had to bring something to the party, and it had the ear of a wide range of foundry customers. "We can get customer input on their manufacturing requirements and share that in

a timely manner with our partners," he says. "I think the key point in building—and keeping—a relationship together is that both partners are able to benefit."

IBM wanted assurance that its customers would always have an adequate supply of products. Chartered needed to add incremental business. Both wanted to spread out the rising costs of process development. "IBM wanted to complement its foundry and ASIC strategy and we were a pure-play foundry," says Chia. "It worked well in terms of a win-win."

Keeping the customer front and center has gone a long way toward making the alliance work. "Focusing on the voice of the customer has enabled us to make sure we are all pulling in the same direction," Chia says. At the same time, Chartered has to keep an eye on its own agenda. Chia spends a lot of time on the Common Platform but has an employee to manage programs that are strategically significant to the foundry.

The members of the Common Platform Technology group have shown that collaborative partnerships can succeed, Jelenik says.

"By joining this alliance Chartered has not only catapulted its technology offering, but also demonstrated that an alliance can be executed strategically and successfully."

*Barbara Jorgensen, a free-lance writer based in Mansfield, MA, specializes in the electronics-distribution, supply-chain, and manufacturing areas.*

# Cypress Semiconductor rides the next waves

TJ Rodgers isn't afraid to talk about changes at Cypress.

By Colleen Taylor

From private equity buyouts to the advent of profitable alternative energy technologies, today's semiconductor industry has no shortage of compelling hot topics. Fortunately, TJ Rodgers, Cypress Semiconductor Corp's founder, president and chief executive officer, has no shortage of equally provocative opinions—along with a vision of how Cypress fits into Silicon Valley's constantly changing landscape.

Thanks to the rising cost of oil, as well as a healthy amount of pop-culture buzz, solar-energy technology was a major newsmaker in 2006. At the head of the alternative energy class was SunPower Corp, a wholly owned subsidiary of Cypress. In November, SunPower acquired large-scale solar-power-system provider PowerLight Corp in a \$330 million deal and, in March 2007, went on to land a governmental grant worth as much as \$10.5 million.

Even so, Rodgers says, SunPower hasn't even begun to see the most of its successes.

"We see ability this year to grow by more than a factor of two. Last year, we grew by a factor of three. The year before that, we grew by a factor of seven. Right now, we're feeling really good about SunPower," Rodgers says.

Given those kinds of growth numbers and media attention, it's no surprise that SunPower's success in 2006 also resulted in some criticism. Activist hedge fund Chapman Capital LLC issued a vitriolic public letter to Cypress Semiconductor's board of directors in December, accusing the

company of underperforming and calling for the launch of a large-scale "corporate reorganization" that would involve splitting from SunPower.

The famously strong-willed Rodgers remains undaunted. "Chapman Capital owns less stock in Cypress than I do by more than a factor of two, and they're pretty much alone in calling for the divestiture of SunPower," Rodgers says. "Chapman Capital has been making their

**"Right now, we're feeling really good about SunPower"**

—TJ Rodgers

demands in a noisy way that is typically sprinkled with invective and untruths. Nonetheless, they have a right to ask if we're doing the best we can to make Cypress' shares more valuable. Our answer to that is 'yes.'"

Rodgers maintains that continuing to work together may well be the best thing for both Cypress and the successful solar company. "If you ask the president of SunPower if he thinks the two companies should be separated right now, he would say 'no,'" Rodgers adds. "SunPower went from a science-based company to a major manufacturer in just a few years, and that would have never happened if they had not been connected with Cypress."

Rodgers has been equally vocal about the growing influence of

private equity money in the electronics industry. "I see the move of private capital into high tech as being positive," Rodgers says. "It forces everybody to look harder at how their companies are structured and whether or not they're getting the most return on their shareholders' money. To me, it's part of the free market. I don't look at people in private equity as the Gordon Gekkos [Michael Douglas' character in *Wall Street*] of the world. I see them as really smart investment people who are teaching a lesson to those of us that run companies."

Cypress kicked off 2007 with the sale of its SVTC (Silicon Valley Tech Center) business unit to private equity companies Oak Hill Capital Partners and Tallwood Venture Capital in a cash deal valued at around \$53 million. "SVTC is a good fab," Rodgers explains. "We sold it because we have stopped pursuing Moore's Law; the products we are currently focusing on, programmable projects, are very happy at 130-nm."

And at February's end, the company went on to further streamline by selling its automotive-image-sensor business for an undisclosed sum to Sensata Technologies Inc.

"You could say we've gotten rid of a lot of distractions," Rodgers says. "I think if you talked to the people involved with the businesses we divested from, they would agree that Cypress did the right thing."



**TJ Rodgers**  
President/  
Chief Executive Officer  
Cypress Semiconductor

*Colleen Taylor is a correspondent for Electronic News.*



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# Reshaping the business of technology

IBM moves front and center.

By Ed Sperling

Several years ago, when IBM began spreading the word in earnest about its proposed electronics ecosystem, most electronics manufacturers scoffed at the idea. They are no longer scoffing.

IBM has put into motion one of the most fundamental shifts in the history of business, let alone electronics. Big Blue, the company that the US Justice Department once reviled for keeping everyone out of its core market, is proving equally adept at profiting by letting everyone in.

That strategy has worked better than anyone could have hoped. In both market leadership and bottom-line performance, IBM has benefited handsomely from the partnering approach. It now develops chips for all three of the major gaming platforms—the Sony Playstation 3, Microsoft Xbox 360, and Nintendo Wii—as well as the manufacturing processes to build them. It also builds advanced chips for supercomputers and racks of servers that run the world's most advanced data centers, and it runs its own state-of-the-art fab that it uses for both collaborative development and advanced chips for its own system-level products.

Like many other successful business shifts, this one is rooted firmly in the intersection between economics and technology. It simply costs too much to stay on the Moore's Law road map as a single company. Solving problems at 32 nm and beyond is a massive undertaking.

"We made a conscious decision that everyone on this planet has something to bring to the table,"

says Bernard Meyerson, IBM's chief technologist. "Many companies believe in accumulating their capital, but how many companies are sharing their intellectual capital?"

The answer is a growing number, thanks to IBM's foresight. Meyerson says IBM realized the future was in partnering a decade ago, beginning with its open-source software. As for semiconductor technology, "We said we are going to collaboratively create a reservoir of precompetitive talent

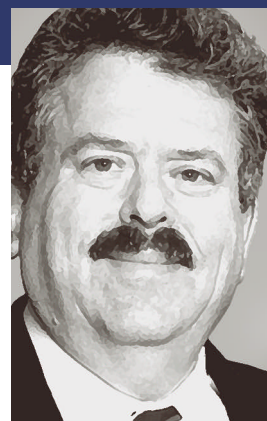
**"We made a conscious decision that everyone on this planet has something to bring to the table."**

**—Bernard Meyerson**

and process capability. Of course, later we may go off and beat each other to death with it in the open market. By working in this fashion, we caught everyone by surprise."

Success also has built more success. In gaming, for example, IBM's success with the Sony Playstation led to contracts with Microsoft and then Nintendo. In the Albany Nanotech Center, IBM's presence helped to draw competitors such as Applied Materials, Tokyo Electron, and ASML into the same development effort, a research-driven 12-in.-process fab that will become IBM's chief development location to 22 nm.

"There was a groundswell here,"



**Bernard Meyerson**  
Vice President and  
Chief Technologist  
Technology Group  
IBM

Meyerson says. "In the [electronics] industry, virtually everyone is aboard. Next came the [manufacturing-equipment] vendors. We now have group meetings with both Tokyo Electron and Applied Materials present—each serious competitors. Nonetheless, we all accept that you've got to work together at the leading edge to get the fundamental work done."

Meyerson believes the development model around collaborative innovation will thrive for the foreseeable future—particularly because manufacturers must holistically address many of the power-related problems in information technology, whether due to current leakage in devices or system inefficiency. Meyerson coined the phrase "holistic design" several years ago, referring to need to think about design in the broadest, system-focused terms. At the time, it was largely an IBM-only approach. The next phase of system development will perhaps also include teams from multiple companies working on the same fundamental problems.

Meyerson says giving others broad access to the family jewels also keeps IBM on its toes. "Everyone inside our shop must ultimately compete with the best of breed to maintain their position in the value chain, and that challenge changes the entire culture of an organization to one of sustained leadership," he says.

*Ed Sperling is editor in chief of Electronic News and Electronic Business.*



# Cyclone economics



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# IR's Lidow: back to the basics

Alex Lidow has brought International Rectifier back to the basics.

By Colleen Taylor



**Alex Lidow**  
Chief Executive Officer  
International Rectifier

**A**t the helm of a company that had secured a reputation for power-efficient-semiconductor technology decades before “low power” was a buzz term, International Rectifier Chief Executive Officer Alex Lidow has continued to keep a steady focus on core priorities since his appointment to the post in 1995. Over the past year, IR posted a series of strong financial quarters and streamlined its business model to zero in on what Lidow considers core principles.

“Several years ago, we decided we would focus our company on what I call the two grand challenges,” Lidow says. “The first one is delivering extreme power density. That’s a very important thing for allowing density to progress along Moore’s Law. The second grand challenge is energy savings. There are three great areas where we can save nearly 30% of the world’s energy: electric motors, lighting, and transportation.”

The company made a further step to refocus the company last November when it inked a deal to sell its power-control-systems business unit to Vishay Intertechnology for \$290 million in cash, cutting the company’s scope by 25%. “Those two grand challenges drive all of our technology development and basically drive this company,” Lidow says. “With the divestiture, we carved out all the elements of our company that do not directly contribute to those two grand challenges.”

From a management perspective, despite the gains IR has reaped from

its newly narrowed scope, the decision to sell the unit was nevertheless a difficult one for Lidow. “A lot of what we sold was the very ‘traditional’ part of IR, and it is hard to part with that,” Lidow says. “It’s stuff that we understand ... friends that we’ve had for about 30 years.” Ultimately, however, the decision to sell was a no-brainer for the continued success of the company. “From a business point of view, it’s important that your business strategy tells you what

**“Now, I view this power management as my life, and my life’s mission.”**

—Alex Lidow

not to do,” Lidow says. “A strategy that allows you to do everything is not much of a strategy. To be consistent with our strategy, we needed to do this sale.”

The sale was the top order of business for IR in 2006 and likely will continue as such into the near future. “The big thing for [2007] is we want to complete the divestiture and make sure that the new company operates as an independent element,” Lidow says. “We need to show that with fast growth and high profitability. The first order of business is to make sure that the company that remains is clean, doesn’t have a lot of excess overheads, and knows how to operate.”

Nevertheless, Lidow, whose expe-

rience with the company dates back nearly 40 years to a summer job at age 16, is looking forward to getting back to IR’s basics. Lidow keeps his perspective clear by continually assessing IR’s performance, measuring the company’s success by simple but all-encompassing guidelines. “We ask ourselves” Are we affecting energy savings in this world? If so, how much and why? And, are we at the leading edge of these IT applications that require the highest power density? If not, why not?”

And, although the buzz about low power has in recent years picked up steam in the semiconductor industry, the idea of keeping in mind the world’s energy savings when making individual business decisions is nothing new for Lidow. He says that, more than 30 years ago, as a graduate student at Stanford University, he learned about the critical nature of power management not just to the semiconductor industry, but also to the global population’s standard of living. “Now, I view this power management as my life, and my life’s mission.”

Discussing his father, Eric, who won a lifetime-achievement award from Reed Business Information in November, Lidow says, “my father and grandfather both have one basic principle in life, which is that the quality of a person is measured by his contribution to society.”

*Colleen Taylor is a correspondent for Electronic News.*



# Linear Technology stays the course

Maier remains committed to long-term, highly profitable strategy.

By Barbara Jorgensen



**Lothar Maier**  
Chief Executive Officer  
Linear Technology

In the ever-shifting landscape of the semiconductor market, a little stability goes a long way. Linear Technology is one of a few chip companies that can boast it hasn't gone through a series of wrenching reinventions during its 25-year history. "Frankly, one of my biggest challenges is to *not* take the company in a different direction," says Lothar Maier, who became chief executive officer in January 2005.

Maier has little reason to diverge from the path set by former Chief Executive Officer Bob Swanson in 1981. Historically, the company has maintained the highest profit margins in the chip industry: gross margins approaching 80% and net margins of approximately 40%. Even during the downturn, Linear managed to turn in net margins of 38%. "To achieve these types of margins you have to do a lot of things really well," says Maier.

At the core of Linear's strategy is an almost fanatical focus on high-performance analog. "From the beginning," says iSuppli analyst Gary Grandbois, "the company has assembled some of the best engineering talent in [Silicon] Valley. It has consistently had an edge in product performance."

Analog technology, which translates real-world elements, such as temperature, pressure, and sound into digital data, was not a priority at National Semiconductor in 1981 when Swanson and three co-workers left to establish Linear Technology. Launching an analog-only company

went against conventional wisdom in those days of the Digital Revolution, but analog's importance grew as the computer, consumer and wireless markets took off. Analog has since become a differentiating technology, and Linear has made Swanson an industry icon.

Linear's enviable profit margins are derived from its market niche—high-performance analog—and the fact that more than 90% of its products are proprietary. Both character-

**"Frankly, one of my biggest challenges is to not take the company in a different direction"**

—Lothar Maier

istics command a price premium in the market. The company maintains its technology edge by investing in its design and engineering resources. Linear has opened three design centers in the past two years. The company also keeps its manufacturing in-house. "The company has done a very good job at quality control and making a very good product," says Grandbois.

Some industry participants compare the development of analog chips to a black art requiring highly specialized engineering and production capabilities. "Many of the processes in our manufacturing are tailored only to analog products," Maier says. "These aren't available if

you outsource." Linear also performs test and assembly in-house, helping maintain high levels of quality.

Diversity in both its product lines and customer base has helped Linear offset much of the cyclic nature typical of the semiconductor market. Although high performance is a requirement in most of the larger analog market, Linear cuts a wide swath—manufacturing some 7500 product lines—targeting the industrial, communication, computer, and consumer markets. The same is true of Linear's customer base: None of Linear's 1500 customers accounts for more than a small fraction of its overall business, which reached \$1.093 billion in sales in fiscal year 2006. "We don't have a lot of mega-customers: we sell to niche-type customers who value our products," Maier says.

Revenue between 2005 and 2006 grew 4%, compared with 30% between 2004 and 2005. To grow the top line of the business, the company continues to pursue new applications for analog products.

"One challenge is deciding where the market will evolve, and that [decision] involves visiting with customers, hearing about what their current needs are, and taking this input and integrating it into new products—end products the customer hasn't even thought about," says Maier.

*Barbara Jorgensen, a free-lance writer based in Mansfield, MA, specializes in the electronics-distribution, supply-chain, and manufacturing areas.*

# Looking ahead is the key to success

Walden Rhines has taken a long-range view on the EDA industry. That strategy is paying off.

By Ann Steffora Mutschler



**Walden Rhines**  
Chief Executive Officer  
Mentor Graphics Corp

In an industry dominated by four main players all vying for the same customer base, Walden C Rhines, chairman and chief executive officer of Wilsonville, OR-based Mentor Graphics Corp, stands out from the rest.

Hailing from a 21-year career with Texas Instruments, Rhines joined Mentor in 1993 and has led the company to about \$800 million in annual revenues with 28 engineering sites worldwide. Differentiating the company from competitors is a key challenge, Rhines admits. To succeed, "It's [crucial] to decide very early on what's going to be important down the road, rather than what's important today. And that's usually hard to do because no one is pressuring you to spend money or dedicate resources to something that's not important today."

That long-range insight, research, and planning are what Rhines believes management-level executives are paid for, even though the results are not clear until long after the fact. "In most companies, you don't even know while the existing management is in place whether they did a good job or not; you find out five or 10 years later," he says. In addition, under Rhines' direction, Mentor has made a concerted effort to find areas in which there was no established infrastructure and whether those areas would become problems in the future.

One of the biggest payoffs with this strategy is beginning to bear fruit: Building on the success of its Calibre physical-design and -verification tool, it became obvious to determine what areas of chip design, verification, and manufacturing could use Calibre as

a foundation, he says. "The whole area of resolution enhancement—all of the things associated with DFM (design for manufacturing), and the things associated with mask masking—became things that we could target that were out of the range of attention of our major competitors and allowed us to build a base early in the game." As a result, Mentor now has one of the largest cadres of DFM tools in the market and is watching revenues slowly but steadily inch up.

**"Partnerships are important because EDA is a business in which you can't develop the product stand-alone; you have to do it interactively."**

—Walden Rhines

Rhines can point to other areas, such as functional verification, emulation, C-based design, automotive electronics, and mixed-signal design, that benefited from his strategy.

Developing EDA tools in a number of disciplines is no small feat and requires key partnerships with semiconductor vendors. "Partnerships are important because EDA is a business in which you can't develop the product stand-alone; you have to do it interactively," Rhines says. "Everyone in EDA has company partners that are interactively evolving products until it gets to some stage where they

say, 'That's good enough; I'll use it.' All technology development has interactivity to it, but EDA in particular has interactivity because how people end up using the tool and addressing the problem is as important as how you solve the problem."

With this kind of complexity in product development, measuring success takes on new facets, Rhines notes. "Rather than [just] looking at total revenue and even profitability, it's much more, 'In the areas where we're number one, are we perceived by customers to add substantial value? Are we the de facto or are we just one alternative? Are we providing capability that is not generally available from others?' Those metrics tell me more about where we are going than the financial ones which tend to be backward-looking: You did things well five years ago, so your financials look better. What's going to say you're going to look better five years from now?"

In the end, the focus on strategy and running the business well has paid off for Rhines, even if it is on a local level. Last year, Mentor was named a recipient of the Oregon Ethics in Business Awards, which honors organizations and individuals that demonstrate ethical business practices. Although Rhines may not be able to literally "take it to the bank," it certainly appears the company is on the right track.

*Ann Steffora Mutschler is a senior editor at Electronic News and Electronic Business.*



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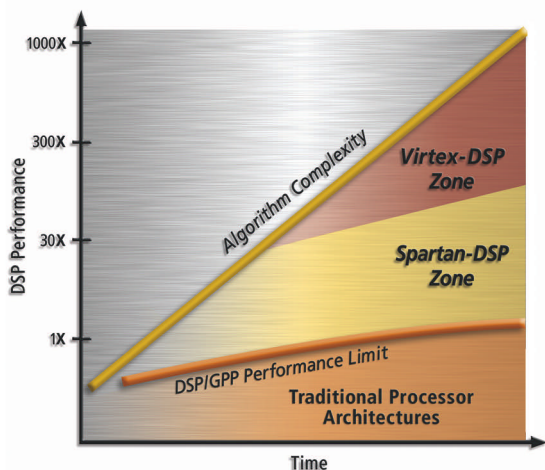
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**Innovation to the Xtreme**

# National Instruments zeroes in on industrial market

Always strong in test and measurement, LabView expands into design.

By Tam Harbert



**James Truchard**  
President/  
Chief Executive Officer  
National Instruments Corp

For more than 30 years, National Instruments Corp has built a solid business by selling tools that help engineers conduct tests and measurements on their designs. With the exception of 2001, revenues have risen steadily, reaching \$660 million in 2006—up 15% from 2005. The company has been consistently profitable since 1990.

But National Instruments may just be getting started. As it begins its fourth decade, the company is venturing into a new market, says James Truchard, co-founder, president, and chief executive officer of the company. “We’ve been growing in test and measurement, and now we have this opportunity to help the customer in the actual design, in the front end of the process,” he says.

Truchard is quick to say that the move is not a change in, but simply an evolution of, the company’s strategy. Indeed, “Doctor T,” as Truchard is known within the company, has always concentrated the company on being close to its scientist and engineer customers, listening carefully to their needs and then identifying new opportunities for its technology. “Truchard has always had an ability to see where the technology is going and then position the company accordingly,” notes Mark Holler, an analyst who covers the test-and-measurement market for Frost & Sullivan.

Analysts praise Truchard for building a strong corporate culture. Even as NI has grown, Truchard maintains a flat organization and is accessible to everyone, says Tim Dehne, senior vice president of R&D. Launched in 1976

while Truchard was at the University of Texas at Austin, the company still hires some 80% of new employees straight out of college. Most of them, like Dehne, who has been there for his entire 20-year career, stay. For the last eight years, the company has been among *Fortune Magazine’s* 100 best companies to work for.

To know where the company is going, you have to understand where it’s been. National Instruments’ first products were GPIB connectors,

**“Truchard has always had an ability to see where the technology is going and then position the company accordingly.”**

—Mark Holler  
Frost & Sullivan

which allowed engineers to attach instruments to a microcomputer. In 1986, the company introduced the LabView graphical programming language and later added a data-acquisition card that allowed engineers to use the PC as a “virtual instrument.”

With its virtual instrumentation approach, National Instruments came to dominate the market for general-purpose instrumentation, particularly in low-level to midlevel performance, says Antonio Antezano, senior analyst for industrial technology at Bear Stearns.

During the 1990s, NI noticed

that customers were using LabView in industrial applications. More recently, as the performance of PCs skyrocketed and processors and sensors proliferated in all sorts of equipment, Truchard realized that NI had an opportunity to expand the use of LabView. The company began introducing enhancements, including a real-time module, the ability to program FPGAs, and the ability to work in distributed systems, he says. These moves ultimately led to NI’s most recent strategic shift to “graphical systems design.” Simply put, the company is marrying the LabView high-level-programming language to reconfigurable hardware so that designers can use the product to design and simulate embedded systems.

With this tool, engineers can design and build a working prototype in days or weeks rather than the one to two years it used to take, says Truchard. “If you can show a venture capitalist a working prototype, you’ll have a lot better chance of getting money.”

Antezano says that this evolution of NI’s tools puts the company in a position to capitalize on the proliferation of sensors in all sorts of equipment.

If it’s true, then LabView and National Instruments may be embarking on their best decade ever. “In many ways, LabView is just getting started, even though it’s been out for 20 years,” says Dehne.

*Tam Harbert is a free-lance journalist specializing in business, technology, and public policy.*



# National Semiconductor reaches for the stars

Signal-path focus propels company into everything from power management to public policy.

By Ed Sperling



**Brian Halla**  
Chief Executive Officer  
National Semiconductor

**N**ational Semiconductor Corp., an icon of the electronics industry, isn't acting as you'd expect an icon to behave. The company has changed its lineup from commodity products to higher end analog devices, boosted its profitability, and regained its standing as one of the premier electronics companies. Not bad, for an electronics company that was founded in 1959—the same year that Robert Noyce and Jack Kilby invented the IC. In fact, last quarter gross margins climbed nearly a point, bookings were up, and the projection for the company was pointed firmly up and to the right. Making the turnaround even more significant, industry participants just a few years ago considered National a commodity analog player.

But that's only part of the story. National's shift away from commodity components has pushed it to the leading edge of power-management design—something that chairman and chief executive officer Brian Halla calls the “cool factor.” National's components fill motherboards for power-management and temperature sensors on the upcoming Tesla electric sports car, for example. Its components are also present in high-end stereo systems, digital cameras, and a variety of consumer devices that are household names.

“The volumes in the Tesla are not going to excite National as a company,” Halla says. “But if National could somehow be part of the solution to leaving hydrocarbons and going to electric, that's pretty exciting.”

National's focus is no longer just the analog interface. It wants to own

the entire signal path. “All of our sales training was done at a signal-path level, and all of our product collateral is now done at a signal path level,” he says. “We're starting to make the turn.”

Halla believes there are three drivers of the electronics industry: energy, health care, and security. “We're already immersed in technology that

**“If National could somehow be part of the solution to leaving hydrocarbons and going to electric, that's pretty exciting.”**

—Brian Halla

can fix so many of the problems that exist today,” he says.

But getting there and keeping the company facing forward have required a reshuffling of resources within National. The company's R&D as a percentage of sales has increased to about 18% and swallowed a larger percentage of the selling, general, and administrative portion of the budget, which has held steady.

The role Halla has carved out for himself on the national stage as former chairman and current board member of the Semiconductor Industry Association is perhaps even more significant for propelling the company's image. Over the past couple of years, he has emerged as

the industry's spokesman against limitations on H-1B visas, restrictions of stock options, and the need to fund engineering schools. “I don't think politicians represent their constituencies anymore,” he says. “They think they do. But you watch these debates on H-1B visas and these claims that the visas are used to get lower cost workers. No. It's just as competitive for a PhD from Iraq as from down the street. You have to pay them going wages. It's no different. People think they're taking jobs away from Americans. They're actually creating jobs.”

Halla, like many others with several decades of history in Silicon Valley, also believes that government funding for research is essential—and lacking. “Bell Labs and Xerox PARC [Palo Alto Research Center] and SRI are all gone. So, all the research happens at universities, but nobody's funding them because DARPA is funding Lockheed and Raytheon.”

He notes that both political parties support research in theory, but nothing gets done because they wind up bickering over issues such as illegal immigration when they discuss H1-B visas. The fallout is companies go where the business conditions are more favorable.

National has taken that route and established a strong global presence. But while the company seems poised to survive just fine, the big question is who its competitors will be.

*Ed Sperling is editor in chief of Electronic News and Electronic Business.*

# SanDisk and flash-memory market see the light

Harari sees the flash memory market as a key component of the digital revolution.

By Debra Bulkeley



**Eli Harari**  
Founder/Chairman/  
Chief Executive Officer  
SanDisk

**A**lthough the memory-chip market has certainly seen better days, Eli Harari, founder, chairman, and chief executive officer of flash-memory-chip maker SanDisk, remains optimistic. Never mind that the flash-memory market experienced a 50% drop in prices at the end of 2006 and saw continued pricing declines into March. The DRAM market was in oversupply throughout the first quarter of 2007, and NAND-component pricing gravely deteriorated. Some industry participants say that the DRAM market might not recover until the second half of this year.

The state of the market negatively impacted many companies, and Harari in February announced the company would lay off about 250 employees worldwide, reduce executive salaries, freeze salaries for all other employees, and freeze hiring in most departments.

Harari's strategy: To maintain market share, the company would lower first-quarter prices for some products to 30 to 40% below fourth-quarter levels. "We ended up with a very challenging environment," he says.

But there is a light at the end of the tunnel: Chip prices for NAND flash, which plummeted 50% due to oversupply in the fourth quarter of 2006, showed signs of a rebound at the end of the first quarter of 2007 after about six months of declines. Harari contends that the market will become even more attractive as the industry develops lower priced products that in turn spawn advanced technologies. Case in point:

In January, Sandisk joined Samsung and TKD with a 32-Gbyte SSD (solid-state disk), intended as a drop-in replacement for a standard, mechanical hard-disk drive. One of the more significant aspects of the 1.8-in. SSD was its low price: SanDisk projects that its 32-Gbyte SSD in a notebook PC could increase the end-user price

**"Typically, the second half of the year is our strongest, and I see no reason why this year will not be the same."**

—Eli Harari

by approximately \$600 in the first half of 2007, which is lower than what the company was charging a year ago for products with SSD.

## Let the good times roll

SanDisk continues to be one of the semiconductor industry's stars. Harari points out that SanDisk had its first \$1 billion quarter in the last quarter of 2006 before prices dropped. (Not taking into account revenue from its acquisition of Msystems, SanDisk's fourth-quarter revenue was \$1.048 billion, an increase of 40% compared with 2005.) Since the 2001 downturn, it has remained consistently profitable.

The company also has been a leader in flash-memory-technology development. It has invented or co-developed many industry-standard formats, including Compact-

Flash, MultiMediaCard, SD, miniSD, Memory Stick Pro, and TransFlash.

The future looks particularly bright for flash memory in light of the rollout of Microsoft Vista. Harari points out that Vista will impact the market in a couple of ways. First, Vista requires approximately 2 Gbytes of DRAM versus the XP operating system's requirement of 1 Gbyte. Microsoft also has recognized that users can employ flash-memory devices in Windows ReadyBoost and ReadyDrive, two Vista add-on memory features. Add the iMac and the Xbox to those using the technology, and SanDisk is certainly ensconced in the computing market.

"It's very early, frankly, for flash memory, and the vector is pointing in the right direction. It's all about demand and supply, and we expect our own supply to increase about 170% [in 2007]; we are growing," Harari says. "This is not a mature market. Flash is becoming very pervasive; it's a very important component of the digital revolution."

Looking to the rest of 2007, he says, "Typically, the second half of the year is our strongest, and I see no reason why this year will not be the same." Harari looks at the current market dip as a challenge, but one that the company will conquer. "There is tremendous growth ahead, and this currently challenging environment will accelerate demand and create new markets."

*Debra Bulkeley is executive editor at Electronic Business.*



# Texas Instruments rides the DSP wave

By focusing on two markets and listening to its customers, TI expands its dominance.

By Tam Harbert

**A** laserlike focus on DSP and analog, a dominant position in the cellular market, and a leadership that stresses listening to the customer has Texas Instruments sitting in a sweet spot.

"The cellular market is going to be bigger than the PC market by the end of the decade, and TI is number one in the cellular market," notes Will Strauss, president of Forward Concepts. He forecasts that the cell-phone market will grow from \$129 billion in 2006 to \$170 billion by 2011. And mobile phones are likely to become more important than the PC, he says.

Texas Instruments is increasing its revenue, particularly in analog and DSP, at the expense of its competitors. Annual revenue for 2006 was \$14.25 billion, up 16% from 2005. Analog revenue grew a whopping 33%. TI's high-performance-analog business has outgrown the top three or four companies in that market over the past four consecutive years, according to Rich Templeton, president and chief executive officer. TI's market share in DSPs rose from 48% in 2003 to 58% in 2005, according to Tony Massimini, chief of technology at Semico Research Corp. (At press time, 2006 numbers were not yet available.)

Templeton, who after 24 years at TI became chief executive officer in 2004, has continued the strategy of his predecessor Tom Engibous: increasing its DSP and analog business and divesting the company of non-core businesses. In 2006, for example, the company sold its sensors-and-controls business for \$3 billion

to Bain Capital LLC, a private equity house, and bought Chipcon, which specialized in low-power RF.

Templeton has increased profitability by focusing on high-performance analog and eliminating its low-end-analog business, says Michael Masdea, managing director at Credit Suisse. Meanwhile, the company has been good at spotting

**"As much as voice drove the first 25 years of DSP, I think video is going to drive the next 25 years,"**

**—Rich Templeton**

and taking advantage of trends in the DSP market, such as designing an integrated chip for the ultralow-end-cell-phone market.

The company can spot such trends only because it listens carefully to its customers, says Templeton. Indeed, Templeton spends 30 to 40% of his time on the road talking with customers, says Mike Hames, senior vice president of application-specific products, who has worked with Templeton for 27 years at TI. "Templeton has made external focus on the customer into an art form," he says.

Only by staying tight with its customers can TI hope to invest far enough ahead of the trends to profit by them, says Templeton.



**Rich Templeton**  
President/  
Chief Executive Officer  
Texas Instruments

For example, the company continues to invest in smartphones, even though they aren't currently getting much attention. "Over the next two to three years, we could find ourselves surprised by that demand because I think most of India and China will use the smartphone as the primary way to get information over the Internet," he says.

Templeton says he also believes that video applications will increasingly dominate the DSP market.

"As much as voice drove the first 25 years of DSP, I think video is going to drive the next 25 years," he notes.

Although the company pursues innovation in promising new markets, Templeton says a big part of his job is to keep the company grounded in reality. "My greatest challenge is keeping the place humble and keeping the place hungry," he says. In fact, analysts are wary of TI's success with and dependence on Nokia, which makes up 10 to 20% of TI's revenue.

Part of fighting complacency is a willingness to challenge how the company has always done things. Witness the company's surprising decision in January to stop developing its own CMOS process. Rather than spend money to develop a process, it will focus on characterization and modeling. "The way you use the process, I believe, will over the next three to four years be the point of greatest differentiation," says Templeton.

*Tam Harbert is a free-lance journalist specializing in business, technology, and public policy.*



# Innovation drives change in China's electronics market

By Amy Wang

**G**rowth in electronics is occurring so quickly in China it has a Doppler effect. Electronics shipments accounted for \$614 billion in sales in 2006, up 24% from the previous year. That figure includes \$64 billion from software alone. Even the domestic market experienced dramatic growth. It increased 22.1% to \$142 billion. Perhaps even more startling, industry profits grew 31%.

The picture isn't perfect, of course. China's currency appreciated 7% in the last 18 months, impacting electronics-manufacturing sectors because many consigned material assembly activities live on 7 to 8% margins. Add to that the extra cost of complying with the European Union's ROHS (Restriction of Hazardous Substances) regulations and the effect on manufacturing is significant.

But overall, optimism is rampant, and China expects to easily survive its blips through sheer inertia and innovation in technology. Innovation has become the new mantra, and it's more than just a catch phrase. China plans to upgrade its role in electronics from "manufactured in China" to "created in China."

The core value of China's 11th five-year plan for electronics is to enhance technology innovation. Among the reasons:

- **Currency appreciation:** The continuous appreciation of China's currency puts pressure on China's electronics industry, particularly manufacturing of low-mix, high-volume products.
- **Trade surplus:** The widening trade surplus has negatively affected international relations and, in some cases, caused conflicts between China and other countries. At the end of last year, China had a \$177.5 billion trade surplus, up 74% from 2005. To balance this surplus, the Chinese government needs to encourage more imports and increase domestic demand, particularly from the countryside.
- **"Green" needs:** To smooth the way of exporting to European countries, which accounted

for one-fourth of China's total exports overseas, China required its manufacturers to comply with EU's ROHS directives. Meanwhile, China has formulated its own version of ROHS, the Administration on the Control of Pollution Caused by Electronic Information Industry. This regulation covers issues involving product design, development, manufacturing, and product sales and took effect on March 1.

- **Energy-saving and conservation concerns:** In 2006, China began strongly promoting energy conservation in white goods, such as air conditioners, refrigerators, and washing machines by defining energy-efficient levels on these products.

## Innovation first

China has used government funding to boost technology-innovation activities, including patent development, technical-standards development and high-tech product production. It is also using that funding to improve intellectual-property protection.

China's homegrown TD-SCDMA (time-division synchronous-code-division multiple access) is a case in point. The central government funded the project and encouraged local Chinese companies to work with international companies to develop the 3G technical standard, equipment, and terminals. To encourage exports of products with more technology involvement, China has revised its export-refund policies. It reduced the export-tax-refund rate for products based on consigned material-assembly activities but increased the export-tax-refund rate for products designed and manufactured in China and supported by product-innovation activities.

Over the last 28 years, China has received \$600 billion in foreign investment, which has helped to triple the nation's GDP (gross domestic product) over the period. The government

*(Continued on page 38)*

### CHINA FACTS

#### Electronics Shipments:

\$614 billion in sales in 2006

That figure includes \$64 billion from software alone

#### Trade Surplus:

\$177.5 billion





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# Actions Semiconductor: From start-up to first place

By Amy Wang

**A**ctions Semiconductor may not exactly be a household name, but, excluding the Apple market, it has emerged as the largest multimedia-SOC (system-on-chip) provider. Headquartered in Zhuhai, Guangdong province, the six-year-old fabless company specializes in MP3 decoder chips. Top-line sales grew 14% last year to \$170 million, which equates to 50% of the global MP3 market.

Even the booming Chinese semiconductor market considers Actions a star. The company analyzed the indigenous MP3 market and correctly concluded that it is packed with small and midsize companies that lack clear product direction, fast turnaround time, or the ability to quickly alter production due to market changes.

It took two years for Actions to develop its first product and establish credit with foundry partners. In 2003, it began generating revenue. Ironically, the company actually benefited from the outbreak of SARS (Severe Acute Respiratory Syndrome) in Asia. It gave Actions time to focus its energy internally and clean up design bugs. With a single MP3 decoder product in hand, it soon realized that limited in-house field-application-engineer resources would never be successful because customers need more than reference designs.

As a start-up, Actions didn't have the necessary experience and credit to offer full-spectrum technical support or a distribution network, so it teamed up with independent design houses to offer turnkey designs for end customers.

In 2003, China's handset business recognized independent design houses as design-service providers. They introduced PCB (printed-circuit-board)-ready designs, which proved to be a springboard for Actions. The independent design houses took Actions' design and used it to develop products and prototypes.

These design houses became known for cre-

ating rapid feature/function assembly using designs or prototypes. The advantage to customers was an immediate understanding of costs and product delivery, which proved important in China because many customers wouldn't sign contracts without seeing the design or prices.

The downside of this model is that many end products look the same because the independent design houses have limited market reach. Portable consumer electronics are one of the key focuses of these design houses. But with enough such relationships, Actions has been able to overcome that limitation.

Most of Actions' partners are small and midsize independent design houses. The company's field-application engineers regularly work with the design houses to develop MP3 products, which in turn creates relationships between Actions and a long list of manufacturers. In 2005, Actions' business grew 167%, and it went public on the Nasdaq exchange. The independent-design-house relationships could take Actions only so far, though. With improved product mix and established market credit, Actions swapped to a distribution strategy to broaden its reach and then broadened its product line to even further increase. For example, the company developed an electricity-utility-meter-control IC to enter a new market. According to the company, it sold 95% of its products through distribution in 2006.

Actions Semiconductor signed a franchise-distribution agreement with Taiwan-based WPI Group, one of the big three distributors in Asia, and GMI Technology. Both WPI and GMI have solid customer bases with Taiwan manufacturers and previous distribution experience with SigmaTel, which they ended to work with Actions.

*Amy Wang is a free-lance writer based in Shenzhen, China.*

## AT A GLANCE

### Actions Semiconductor

**Established:** 2001

### Registration:

Cayman Islands

### Headquarter:

Zhuhai, Guangdong province

### Branches:

Beijing, Shenzhen (Guangdong)

### Staff:

More than 400

### Major products:

multimedia SOC, metering ICs, IP, and ASIC business.

### Initial public offering:

November 2005, listed on Nasdaq through Credit Suisse First Boston.





# India's appeal to electronics industry gets hotter

By Chitra Giridhar

In more ways than one, India is a hot spot for the electronics industry. First, its blistering economic growth of 9% is having a positive impact on the electronics industry as demand for mobile phones, digital cameras, flat-panel TVs, and PCs is up across the board. This demand is prompting many companies to boost their staffing and increase investments in manufacturing and design facilities, says Bandaru Naidu, managing director of SemIndia.

But the country is attracting considerable attention in mobile telecom, and many say that India is the new China in this realm. The Indian government forecasts additional investments in the telecom-manufacturing sector alone to total \$2 billion this year. "Developments in telecom have hit a rapid tempo, and we are expecting more aggressive growth," says Bill Muir, regional president-Asia for electronic manufacturing-services company Jabil Circuit. The government has good reason to expect that growth: India has an estimated 150 million mobile subscribers, but market penetration is still only 15%. India is the fourth-largest mobile market behind China, the United States, and Russia.

In February, the Indian government finally responded to the high-tech industry's desire for incentives for major global semiconductor companies to establish manufacturing facilities in the country. Under the new policy, manufacturers setting up wafer-fabrication and other high-end manufacturing units outside special economic zones will be eligible to receive a subsidy of 25% of the total capital investment.

These companies also will be exempt from duty on capital goods. Fab units need to invest at least \$550 million to take advantage of the subsidies, and units manufacturing semiconductors, displays, storage devices, solar cells, or other advanced microtechnology and nanotechnology products will need to invest at least \$220 million.

"The new semiconductor policy will gener-

ate considerable interest among wafer fab companies, manufacturers of displays, and companies looking to set up semiconductor assembly, test, and packaging units," predicts Gartner analyst Ganesh Ramamoorthy.

Although the policy has generated considerable optimism in the Indian industry, Rajendra Khare, erstwhile/former chairman of the India Semiconductor Association, believes it will take a couple of years for the entire ecosystem to develop.

Balakrishnan Dorairaj, chief operating officer at Spel Semiconductor, concurs. "Globally, the trend has been to graduate from chip design to assembly and test. Fab has always come as the final step," he says. Another expected benefit of the semiconductor policy will be cross-border mergers and acquisition deals in the local electronics industry, says Sharada Prahladrao of ARC Advisory Group.

## Design capabilities will mature

India's total chip-design market is growing at a rapid clip, with market revenue expected to reach \$14 billion by 2010. It is growing at a compound annual growth rate of 30%, up from \$3.25 billion in 2005, according to an ISA-Frost and Sullivan report. "Nearly 50% of the design activities in India are in the areas of wireless and wired communications," says Jagdish Rebello, director and principal analyst with iSuppli. "Consumer electronics represents the next-largest application."

Most independent design houses in India are involved primarily in front-end design work, providing test- and verification-level services. However, a number of companies, such as Wipro, TCS, and HCL, can perform end-to-end design activities, ranging from specification to tapeout. As these Indian companies continue to mature in experience and capabilities, iSuppli projects their contribution to the total market will grow to 49% by 2010, up from 35% in 2005.

*(Continued on page 38)*

(Continued from page 36)

recently instituted regulations to restrict low-margin and high-resource manufacturing activities. It limits foreign investment in those areas and encourages high-technology investment projects in China.

All of these actions are consistent with China's electronics market. Computer, communications, and consumer-electronics products still dominate the major market demand. New generations of these products, such as DTV and portable digital products, have experienced high growth in China's market. The emerging markets, such as automotive electronics, medical electronics, and instruments, also have shown high growth.

### Changes ahead

Significant changes began appearing in China's electronics market in 2006 that highlight the emphasis on innovation. First, cooperation began increasing between Chinese and international companies in developing technical standards and products based on those standards to serve China's home market.

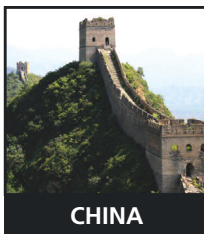
Siemens, for one, has been actively involved in the development of China's 3G standard—TD-SCDMA. It worked closely with Huawei Technology (Shenzhen) and Datang Telecom (Beijing) to share its patents and leading-edge technology, which have enabled TD-SCDMA development. T3G, meanwhile, is a joint venture between Samsung, Philips, and Datang Telecom, which engaged in TD-SCDMA-chip design and development. Some TD-SCDMA handsets use the company's baseband and RF front-end chips.

Not all of China's demand is at the leading edge. Most handsets, even in the tier-one cities, are still 2.5G, and the villages demand 2G phones.

Other business models are beginning to emerge that rely heavily on innovation. Independent design houses, for example, are shifting to an ODM (original-design-manufacturing) approach, so that they design and develop their own products, particularly in the handset market.

Chinese distributors likewise are shifting direction, combining franchise distribution with the independent-design-house model. The goal in this case is to combine designs with demand creation.

In China's electronics industry, the new standard is innovation, and innovation fosters change.



CHINA

(Continued from page 37)

To beef up their capabilities and stay abreast of technical developments, companies are continuing to invest in training, tools, and people.

HCL, for example, has invested about \$2 million over the past year in its chip-design group to build IP intellectual property (IP) in the analog/mixed-signal and DSP markets.

### Focus on IP

Although Indian engineers often receive kudos for their design prowess, patent ownership does not reflect that. According to the ISA-E&Y Benchmarking Study, "India in the Global Semiconductor Design Ecosystem 2007," Indian companies filed 2145 US patent applications and received 621 from 2001 to 2005. Although this number is less than half the number that companies in China filed—4700—the success rate for patents for Indian applications is about the same as that for China: approximately 28%.

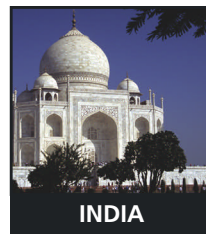
One reason for the relatively low number of patent applications from India is that Indian companies often handle portions of projects rather than executing entire IP or product development. Further, captive centers of multinational corporations, which account for almost one-half of the revenues of the entire industry, dominate the design-services industry in India. This situation further exacerbates the patent drought.

"Unless product development takes priority as an activity, there is always a limit to which an organization can move up the value chain," says Vishwanath Padur, vice president of CoreEI Programmable Solutions. He notes that local service companies are now beginning to create key IP and complex designs and are offering services around them to international customers.

"Indian design companies will continue to move up the value chain by increasingly accomplishing the entire design instead of doing piecemeal work," says Mayank Jain, a research analyst in India for In-Stat.

Take, for instance, Hyderabad-based Moschip Semiconductor Technology, which has developed chips to bridge USB and high-speed serial interfaces. The company's MCS9835 chip integrates four UARTs and a high-speed-USB-compliant device into a single 64-pin package.

"Indian companies will continue to focus on creating standards-based niche IPs and proving them in silicon," predicts Jain of In-Stat.



INDIA

Amy Wang is a free-lance writer based in Shenzhen, China.

Chitra Giridhar is Bangalore correspondent for EDN Asia.



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LM5574	6 to 75	0.5	TSSOP-16
LM25574	6 to 42	0.5	TSSOP-16



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# Manufacturing boom shows New Europe's strength

By Drew Wilson

Europe's finest story in 2006 came from the CEE (Central and Eastern European) region. In countries that Old Europe views largely as destinations for EU (European Union) handouts, billions of dollars from Asian flat-panel-TV makers went into the region, christening CEE as Europe's version of China.

Poland was the standout, followed by the Czech Republic and Hungary. Poland received investments for new factories or expansions from LG-Philips, Toshiba, Funai, Quanta, and Sharp, which led the pack with a \$194 million LCD-assembly plant. Dozens of small suppliers, including Sumitomo Corp and 3M Corp, are

starting to cluster around the factories. "We consider that CEE is growing as fast as China in electronics," says Sebastien Rospide, electronics and components-market analyst at Paris-based Decision Consult. "This is a driver for Europe as a whole."

Industry sources agree that the investment surge was not a one-time event and expect it to continue in 2007. Indeed, Samsung Electronics in March announced that it would invest \$600 million in an LCD-TV plant in Slovakia. Andrew Murray, director of display research at iSuppli Europe, says he believes Chinese TV manufacturers could be among the next wave of arrivals. He says that manufacturing is pouring into CEE due to several factors that aligned in 2006. One factor is the market itself. According to iSuppli, Europe will become the largest LCD-TV market in 2007, growing 50% to 20 million units. Another is that EU-based assembly facilities avoid a 14% import duty Europe imposes on finished TV sets.

Moreover, LCD- and plasma-TV

prices are falling about 3% per month. Building TVs in Asia and shipping them could result in a 5% price decline on arrival at an EU port. A European base means that the finished product hits the market much faster.

At the same time, regional and city governments have been supplementing the region's relatively low taxes and labor rates. The governments have been generously negotiating manufacturing incentives case by case. "Having assembly facilities in CEE is a significant competitive advantage to market products in those countries," Murray says.

The role of CEE to Western Europe is analogous to that of Mexico and the United States. These doorstep countries serve as low-cost factories for products aimed at their neighbors.

"Europe has now nearly a 500 million population with certain purchasing power," Rospide says. "There's a strong advantage in terms of localization for production."

Factory investments last year gave Europe a production boost. According to preliminary figures from Decision Consult, total electronics production in Europe was up 5.5% in 2006, representing \$321 billion.

Manufacturing fled Western Europe due to high taxes, wages, and regulations. But Europe's manufacturing base now appears to be dividing like a cell. The Eastern part increasingly focuses on high-volume, low-mix products, and Western Europe is moving up the value ladder to manufacture professional products, Rospide says.

Manufacturing aside, New Europe also is growing a swathe of small and midsize software companies, according to Jiri Polak, head of Deloitte & Touche's Technology Fast 50 program in Prague, which tracks small CEE technology companies.

## EUROPE'S IC MARKET TOTAL SALES

### 2006 Total European IC Market:

- \$33.5 billion+1% growth over 2005  
Europe represents 16% of the total worldwide IC market.

### 2007 Total European IC Market:

- Forecast: \$34.1 billion+2% growth over 2006
- Europe is forecast to represent 15% of the total worldwide IC market.

Source: IC Insights Inc

## EUROPE'S INFORMATION TECHNOLOGY AND TELECOMMUNICATIONS (ICT) MARKET

**2006:** \$844 billion+3.1% growth over 2005

**2007 Forecast:** \$876 billion+2.9% growth over 2006

**2008 Forecast:** \$901 billion+2.9% growth over 2007

Source: EITO

*Drew Wilson is a free-lance writer based in Berlin.*





# The Persian Gulf's other side: booming demand and development

By John F Mason

Investment in electronics is booming in the Persian Gulf area. Throughout the region, giants of technology, such as IBM, Microsoft, and Nortel, are setting up R&D centers; donating equipment to schools and government agencies; and selling vast amounts of their products, services, and software. But this isn't the kind of information you'll readily find on their Web sites. Setting up shop in the Arab world may be good for business, but it's something most companies don't want to discuss outside the region.

At the center of this investment is Dubai, part of the UAE (United Arab Emirates) and now a hub of the Middle East economy. With its strategic location, tax-free living, and consistently strong economic outlook, Dubai has emerged as a base for multinationals targeting markets in Central Asia, the Middle East, Africa, the Asian subcontinent, and the eastern Mediterranean. In total, these regions have a population of more than 2 billion and a combined gross domestic product of \$6.7 trillion. Dubai's emergence is no accident. Within its borders are DIC (Dubai Internet City); Dubai Healthcare City; and DSO (Dubai Silicon Oasis), a massive industrial park currently under development whose goal is to become a hub for microelectronics and semiconductor companies.

The United Arab Emirates has also become a center for advanced research. On Dec 17, 2006, IBM launched the first on-demand supercomputing center in Abu Dhabi at the CERT (Centre of Excellence for Applied Research and Training), the UAE's leading technology and research organization. CERT will use the center, which is based on IBM's Blue Gene, to enhance R&D capabilities in various sectors. "The new center takes the region to a new level of highly

needed R&D capabilities, says Tayeb Kamali, vice chairman of CERT. "Major industries will witness a drastic improvement in their high-performance-computing capabilities."

CERT is working with a number of independent software vendors in providing applications for industries to use and gain access through the on-demand environment. For instance, CERT's partner organization, Tsunami Development, will launch the Tsunami Seismic imaging-software suite available on the CERT's Blue Gene for Oil and Gas clients to use in South Asia, the Middle East, and North Africa.

Newly established AcuraGen, a specialized medical-research company based in the UAE, India, and the United States, will tap into CERT's Blue Gene for oncology research. "We anticipate that the center will witness unprecedented levels of computing power that will speed the pace of development and help different sectors prosper," says Takreem El-Tohamy, general manager of IBM Middle East, Egypt, and Pakistan. CERT has also signed the largest telematics deal in history with IBM.

Two groups oversee development in the Gulf area. One is the GCC (Gulf Co-Operation Council), which includes Saudi Arabia, Kuwait, Bahrain, Oman, Qatar, and the UAE. The second, Levant, includes Syria, Lebanon, Jordan, and Palestine. These groups usually lump Egypt in with Levant, although sometimes the GCC includes it. Saudi Arabia constitutes about 55% of the GCC market.

So far, there is little manufacturing under way but plenty of money to drive demand in any of these areas. When a mobile phone comes out with a new feature, affluent Arabs immediately abandon the old one and buy the new one. This fact explains why Lenovo set up operations in Saudi Arabia almost immediately after acquiring IBM's PC division. Oil money flows freely into consumer electronics.

*(Continued on page 46)*

## PERSIAN GULF'S MARKET

### Includes:

Central Asia, the Middle East, Africa, the Asian subcontinent, and the eastern Mediterranean

### Population:

More than 2 billion

### Combined Gross Domestic Product:

\$6.7 trillion



# Western Europe's semiconductor landscape drastically changed

By Drew Wilson

**W**aves of change swept across Europe's semiconductor landscape in 2006, and the region looks different as a result.

The continent's traditional chip industry, which the three top chip houses dominated with big fabs and little subcontracting, is gone. Last year's fragmentation also saw semiconductor units separated from parent companies. For example, a group of private equity firms bought Philips Semiconductor and renamed it NXP Semiconductors; Infineon spun out its memory business, which became Qimonda.

STMicroelectronics, Europe's last large chip company, may be next. Rumors persist that ST is prepared to shed its flash memory division—and the company hasn't denied it. In December, ST even created a Flash Memories Group for all flash activities "to strategically reposition our flash memory operations," according to a company spokesman.

"Flash has become so commodity oriented, it's difficult to generate as much profit as STMicro hoped when it initially got into it," says Brian Matas, vice president of market research for IC Insights Inc. "Companies have to stay focused on one or two product areas due to the spiraling costs of developing next-generation products."

Last year also saw the erosion of the Crolles2 R&D alliance, Europe's centerpiece of advanced chip-process development that included STMicroelectronics, NXP, and Freescale Semiconductor. NXP pulled out of the alliance, and Freescale, also with new private owners, decided to reduce its participation. STM remains committed to Crolles2 and is attempting to attract other partners, according to Jean-Philippe Dauvin, STM's chief economist emeritus. "Private equity will refocus R&D; that's obvious," Dauvin says. "Consolidation is in process, and private equity is a new partner in the consolidation."

Chips aside, Europe's electronics manufacturing story is also about accelerated change.

As CEE (Central and Eastern Europe) clearly becomes Europe's answer to China, Old Europe is rebuilding the manufacturing industry that had largely fled east to lower cost locales. According to Sebastien Rospide, electronics- and components-market analyst at Paris-based Decision Consult, Western European manufacturers are starting to grab opportunities in what he calls the emerging professional sectors, such as industrial, medical, aerospace, automotive-safety systems, and security-infrastructure sectors. These products are typically designed in Western Europe and have lower volume but higher reliability requirements.

A Eurozone economy that is showing signs of recovery momentum is helping to lift expectations. Germany, Europe's growth engine, saw GDP (gross-domestic-product) growth of 2.7% last year, its highest in more than a decade. Likewise, Europe's information-technology-and-telecommunications market is also expected to increase 2.9% this year to a staggering \$876 billion, with similar growth in 2008, according to the EITO (European Information Technology Observatory).

The European Union government in Brussels is boosting the information-technology-and-telecommunications market by pushing i2010, its strategy for developing products. EITO expects logistics, security technologies, electronic-health services, and the conversion of public administration to electronic-government to create demand for suppliers.

Brussels is also this year sending ripples of change that the industry around the globe will feel as core environmental legislation debuts. In June, the REACH (Registration, Evaluation, and Authorization of Chemicals) regulation comes into force, affecting companies importing to or manufacturing in the EU.

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*Drew Wilson is a free-lance writer based in Berlin.*



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# Hot companies hone in on targeted markets

By Dennis Normile

**T**here is probably no better advertisement for a consumer-product launch than lines of people waiting for it to go on sale, and that was the welcome waiting for Nintendo's Wii when it hit the North American market last November. In New York, 3000 people lined up outside the Times Square Toys 'R' Us store. More than 2000 were outside a game store in Los Angeles. Nintendo sold 600,000 Wiis in the first eight days it was available in North America. In Japan, people who had waited outside stores overnight snapped up the 400,000 units available before noon on the first day of sales. In just those two launches, Nintendo took a giant step toward its goal of selling 6 million Wiis in its fiscal year through March 2007. Even more significantly, Nintendo is once again redefining

video games and boosting its bottom line. The Wii is expected to drive Nintendo sales to \$7.65 billion in the year ending March 2007, up 77% versus last year, with net profit rising 18% to \$1.02 billion.

The people behind this product are Nintendo President Satoru Iwata and Shigeru Miyamoto, a senior managing director

in charge of creative content. But Nintendo is not the only Japanese company achieving enviable profits and strong growth by dominating a carefully targeted business segment. Another example is Canon Inc, where Chairman and Chief Executive Officer Fujio Mitarai has carefully honed an innovation strategy since taking the helm of the company in 1995. Canon spends a whopping 7.4% of net sales on R&D, far ahead of the industry average. And the company gets more bang for the buck by concentrating its research on technologies that give Canon's products a differentiating, competitive edge. For its digital cameras, for example, Canon has developed its own CMOS

image sensors and face-recognition techniques that result in sharper, better focused pictures. These advantages have helped Canon capture a world-leading 22% of the digital-camera market by volume. Canon's camera sales rose 13.1% in 2006 to \$8.9 billion, but operating profit on cameras jumped 54.7% to \$2.3 billion, thanks to a shift toward higher margin models and cost cutting. Digital cameras helped lead Canon's sales up 10.7% to \$35.4 billion, yielding an 11% jump in net income to \$3.9 billion for the year through December 2006. At a strategy presentation on March 2, Mitarai proclaimed that Canon will follow this tactic of differentiating products through proprietary technology across its entire product line. It is aiming for sales of \$47 billion, with net income of \$4.7 billion by 2010.

Kyoto-based Nidec Corp is another Japanese company with a niche strategy. Nidec, whose president and chief executive officer is Shigenobu Nagamori, is the largest disk-drive-motor maker. Its motors are at the heart of iPods, DVD players, and other gadgets. Nidec has gradually tightened its grip on the market by continually improving motor performance and shrinking size. Over the last year, Nagamori has been on an acquisition spree, buying four companies in related businesses, including Brilliant Manufacturing Ltd, a Singaporean manufacturer of hard-disk-drive housings, and Japan Servo Co, a Hitachi Ltd subsidiary that makes precision motors for radio-controlled cars and robots. Nidec plans acquisitions to both bolster its strategic position and double sales to \$8.5 billion by 2010.

Targeting a niche market appears to be the winning strategy for many companies in Japan. *(More on Japan on page 46)*

## HOT COMPANIES

Some of the hot companies in Japan that are targeting specific markets:

- Nintendo
- Canon Inc.
- Nidec Corp.

Dennis Normile ([dnormile@gol.com](mailto:dnormile@gol.com)) is a science and technology writer based in Tokyo.



# Elpida transforms its DRAM business

By Kenji Tsuda

**D**RAM provider Elpida Memory had revenues of more than \$4.11 billion in fiscal year 2006, which ended in March 31, 2007, up from \$2.03 billion in fiscal 2005. The company's profit in 2006 was \$587 million. At their peak, Japanese companies accounted for 50% of global DRAM sales. That number has shrunk to 20%, and Elpida, a joint venture between NEC and Hitachi, is now the only DRAM manufacturer in Japan.

But Elpida's initial performance in 1999 was unimpressive. For the first three years, the company lost its market share. NEC and Hitachi were vying for leadership, impeding the design of competitive products. Sales continued to shrink, making the parent companies reluctant to invest in the spin-off.

In the shadow of an impending crisis, Elpida's board in 2002 appointed Yukio Sakamoto as chief executive officer to restructure the company. Sakamoto had experience in reorganizing companies from his tenures at Japan Foundry (now UMC Japan) and at the semiconductor division in Kobe Steel Ltd.

Sakamoto immediately asked their parent companies for money to beef up the production lines at Elpida. NEC and Hitachi balked, so Sakamoto went to outside companies, including Intel, to raise money. His efforts proved successful. He raised \$1.5 billion, which he used to purchase state-of-the-art equipment.

That capital bolstered employee morale, as well. The results were impressive. Elpida has steadily grown since then. It now produces 80,000 90-nm wafers per month, and investment continues steadily. This year, Elpida will invest \$1.5 billion, half of that for the 70-nm-process Hiroshima facility and approximately \$756 million for the Hiroshima facility's 70-nm process-technology line. A total of \$83 million will go toward R&D, and \$671 million will go to Rexchip Electronics, a joint venture between Elpida and Taiwan's Powerchip Semiconductor. That investment comes on the

heels of a \$1.2 billion investment in 2006.

Elpida last December began its 70-nm production. Yield currently is greater than 80% in 512-Mbit products and 99% at the 90-nm process level, Sakamoto says. He expects the 70-nm products to soon increase yield to almost the same level and plans to boost 70-nm production to 40,000 wafers per month by July.

Elpida also is aggressively shifting from 200- to 300-mm wafer lines. It will sell all 200-mm lines to Chinese companies. "Most of our competitors have 200-mm lines, leading them to lose competitiveness," Sakamoto says.

Elpida focuses on and splits its design efforts between the consumer and computer markets. Consumer DRAM for digital still cameras and cellular phones are steadily decreasing in price at 25% annually. Computer-DRAM prices, meanwhile, go rapidly up and down, depending upon supply and demand. In the wake of sluggish Vista sales, DRAM prices dropped, but they're now starting to increase.

## Future development

Engineers at Elpida will join the IMEC (Inter-university Microelectronics Center) consortium for leading-edge technology development beyond the 45-nm process, Sakamoto says. "Global expertise gathers at IMEC. Unfortunately, Japanese consortiums offer an unclear purpose and have developed technologies nobody uses."

Elpida is developing a PRAM (phase-change random-access memory) at its Hiroshima factory and plans to ship products in 2008. So far, however, PRAM has no clear application. "If DRAM replaces the PRAM, its capacity requires at least 1-Gbit density. But Intel ships only 128-Mbit products. It will take two years to ramp this market," Sakamoto says.

## AT A GLANCE

### Company:

Elpida Memory

### Headquarters:

Tokyo, Japan

### President and CEO:

Yukio Sakamoto

### FY Revenues 2006:

More than \$4.11B

### Business:

DRAM manufacturer

*Kenji Tsuda is Editorial Director for EDN Japan.*



(Continued from page 41)

### Telecommunications explosion

The leading market in all these countries is telecommunications. The Middle East and north and sub-Saharan Africa have a growing abundance of telecom operators with a conglomerate of local and foreign investors. All of them are eager to be the leaders in this exploding market for communications of all kinds, especially mobile. Fixed-line systems are next.

Building a telecommunications company is an expensive undertaking. Industry analysts estimate it costs \$500 million to build a small to midsized national network for 1 million subscribers. Still, the payoff can be significant. Their installation creates a sizable market in itself. The four leaders in this market are Egypt, Saudi Arabia, the UAE, and Kuwait, with Kuwait having two established winners, MTC and Wataniya. Wataniya, with operations in Algeria that the company launched last year and Tunisia, currently has more than 3 million subscribers.

Despite the cost, a small country, such as Kuwait, can profitably have two or more telecom companies. The pattern is to establish one and then spread out to nearby countries. Meanwhile, all three are opening their own telephone companies in other countries. Telecom expansion seems to have no shortage of backers. On Feb 13, 2007, Wataniya announced that it had inked a \$1 billion syndicated credit deal with leading European, Asian, Middle Eastern, and Kuwait banks. BNP Paribas acted as the sole underwriter.

"Since the launch of Wataniya Telecom seven years ago, we have been consistent in our investment approach in Kuwait and the region," says Faisal Al-Ayyar, the company's chairman. "We are now recognized as a leader in innovation in this market and known for being a solid and rewarding investment."

Dubai's telephone-company market is due for a shake-up with the launch of the much delayed, Du, which will compete with incumbent Etisalat. Although this launch may appear to be normal competition on the surface, Du and Etisalat are mostly state-owned. The most aggressive and possibly the largest in Egypt and the entire Middle East telecom company is Orascom Telecom. It is also the most diversified operator in the Middle East, Africa, and Pakistan. Orascom is now gainfully ensconced in seven emerging markets with a licensed population of 460 million and an average market penetration of 11.5%.



## Nintendo executives: Wii are here to play

By Dennis Normile

Nintendo President Satoru Iwata, 48, is a game producer at heart. He started programming games for Hal Laboratory, which specializes in games for Nintendo consoles, while still a computer science student at Tokyo Institute of Technology. He joined HAL after graduation and rose to the presidency, having worked on such hit games as *Balloon Fight*, *EarthBound*, and the Kirby games.

He moved to Nintendo in 2000 as head of corporate planning and, in 2002, replaced Hiroshi Yamauchi, Nintendo's president since 1949. The first big product of his watch, the Nintendo DS, hit the market in 2004 and sold 35.6 million units worldwide by the end of 2006.

Shigeru Miyamoto, 54, a senior managing director in charge of creative content, is the creative genius behind some of the most popular video games of the last three decades, including *Donkey Kong*, the megafranchise *Super Mario Brothers*, *Legend of Zelda*, *Star Fox*, *Wave Race*, and the *Pikmin* series. That string of hits earned him a Lifetime Achievement Award at the Game Developers' Choice Awards in March 2007.

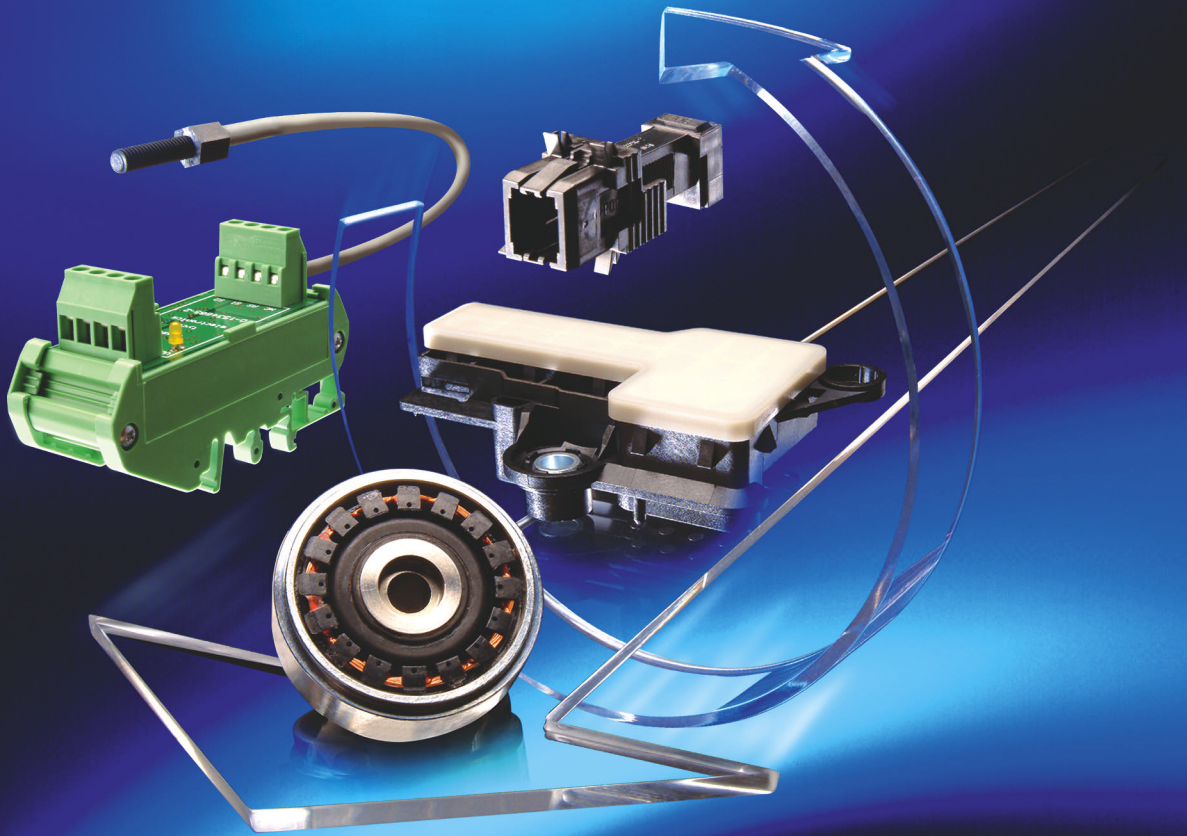
When this pair started planning a game console to succeed the Nintendo GameCube, they felt "a strong sense of crisis about the future of the video game industry," says Iwata. By the early 2000s, growth in the North American game market had become anemic. The Japanese market was actually shrinking. A Nintendo study concluded that fewer people wanted to invest the time and effort needed to learn how to enjoy the increasingly intricate games.

Nintendo decided to focus on developing a product that anyone, regardless of age, gender, or gaming experience, could enjoy. So, while Sony and Microsoft were cramming more raw power into their next-generation games—Sony's PlayStation 3 and Microsoft's Xbox 360—Nintendo was developing a different type of wireless controller. The Wii Remote is simplicity itself. You can use it as a pointing device. And the handheld controller comes with sophisticated sensors that detect motion and rotation in three directions.

To extend the appeal of the Wii, Nintendo is developing a "health pack" with exercise instructions. "Wii is not merely new entertainment, it's a new lifestyle," says Iwata. The only question is: What's next in Nintendo's game plan?

Dennis Normile ([dnormile@gol.com](mailto:dnormile@gol.com)) is a science and technology writer based in Tokyo.

John F. Mason is a free-lance writer.



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Blinding, sometimes scorching, insights into the global electronics industry.



# The **BRIGHTEST** **IDEAS** *in* **ELECTRONICS**

**T**he top editors of Electronic News, Electronic Business and EDN sat down with John Daane, president and CEO of Altera; Roy Vallee, chairman and CEO of Avnet; Bernard Meyerson, chief technologist at IBM; Lothar Maier, CEO of Linear Technology; Walden Rhines, chairman and CEO of Mentor Graphics; James Truchard, president and CEO of National Instruments; and Brian Halla, chairman and CEO of National Semiconductor. What follows are excerpts of that conversation.

**Q: Looking forward, will technology be the differentiator?**

**Meyerson:** If you're implying that technology is commoditized to the point that everyone can step back and make their living on design alone, I would say, 'no.' The fact of the matter is, technology can be a very significant differentiator. The trick is not to ever fool yourself that it's the only differentiator. A consumer buys systems. That consumer doesn't buy an actual chip, per se. There's a whole lot more to getting to a system than the chip itself or the technology underlying it. Leveraging the technology sometimes requires incredible mastery of the software at the opposite end of the spectrum. It's the ability to integrate, to build the ecosystem that drives the quality result the consumer looks for that actually differentiates you. Technology is one underlying element you can't ignore.

**Truchard:** Innovation is often the driver of success. Innovation is backed by technology. We have to have the support for the innovation. Many times, technology is a key component to innovation.

**Q: What do you actually mean by 'technology'? If you ask Intel, they would say their process technology is their technology more than their**

**Core Duo architecture. On the other hand, someone else might think it's their processor.**

**Maier:** The basis is really invention, even with the microprocessor. Somebody had to invent that. The technology allows you to extend that invention, but the core of our industry is the creativity and the invention that comes from people's imagination. That's what drives this business. Technology is just one of the tools that help us move forward.

**Q: As we start getting into some outrageously expensive chip technology, though, not as many people will be able to justify those expenses. How does that affect all of this?**

**Rhines:** They're shifting their cost base at the same time they attack design. If you look at the move to a greater degree of fabless or 'fab lite,' that frees up a lot of resource that was being spent in redundant process development and allows them to channel in other areas of differentiation. Design is the most obvious, but there are others, as well. On the design side, by focusing their resources, they pick areas of technology where they can build an infrastructure and a base of design IP [intellectual property] and design expertise. They can then differentiate themselves by a superior understanding of the system-design requirements and the definition and the execution of those designs and, at the same time, reduce that cost that appears to be becoming prohibitive through design reuse and being able to support those designs more cost-effectively.

**Truchard:** That's exactly right. As chips become more complex, more function will be put on their chips. Then, the real issue is the software that supports these chips and provides the specialization that's needed.

Back row, left to right; Brian Halla, National Semiconductor; Bernard Meyerson, IBM; John Daane, Altera; and Roy Vallee, Avnet Inc. Front row, left to right; Walden Rhines, Mentor Graphics Corp; Lothar Maier, Linear Technology; and James Truchard, National Instruments Corp.





**Andy Grove came from Hungary. He'd be sent back today. 'Sorry Andy, visa denied.'**

— Brian Halla, CEO,  
National Semiconductor

These chips can have a lot of complexity. Some processor has to define the complexity that's needed. It's the software that can make this happen.

**Vallee:** All of those comments play into the high-unit-volume market, with consumer devices as the icon. But from a distributor's perspective, there's still a significant market out there for standard products like analog that are used across all systems and really don't make sense to be integrated into the SOC [system on chip], and then programmables, which are huge distribution items and which can be standard-produced. Maybe the market is bifurcating between these blockbuster megachips that are highly integrated, high-volume ASSPs [application-specific standard products], and these standard products that are going to be used across a broad base of systems.

**Daane:** We talked about this five years ago. At that time, it was like saying the Earth is round to a group that believed it was flat. We said the costs were going to increase for semiconductor design, and that would cause the industry to have to go through a major shift. There are two things people are doing today in reaction to the high cost of design. Number one is they're trying to move design to a lower cost location. That's one way to continue to afford to design—to move to an area where engineers cost less. I think that is ultimately a Band-Aid, because as you move forward with Moore's Law, the technology simply will continue to cost more with every process node. That one-time benefit you got is simply that. Ultimately you're going to fall victim to the increasing cost of Moore's Law. Number two, I think the dynamic happening in the industry today is companies are trying to gain market share within their segment. One way to afford the increased R&D spend at any process node is having more market share. We're seeing semiconductor companies divest themselves of operations that are not part of their core and then reacquire around their core to increase market share. I'd agree fundamentally that there are going to be lots of technologies that make up semiconductors. But the products that best ride Moore's Law long term are programmable types of products, meaning DSPs, microprocessors, microcontrollers, and I'm sure there will be others over time. The advantage of a programmable product is you can produce one standard

product, sell it to 1000 customers, and, through that process, aggregate enough business to continue the investment in technology.

**Q:** There's been a big debate over H1-B visas. Are they a way of providing lower-cost labor in the United States as many of the newspaper articles suggest, or is it more a question of not enough qualified people?

**Halla:** The common reaction is there are 128,000 jobs that foreigners are trying to steal. We all know that within the K-12 pipeline, we don't have enough people coming down that pipe from the United States to fill all those jobs. Our politicians think the United States has always been ahead in technology. As recently as 1957, when we saw Sputnik go up, we found out loud and clear that we weren't. We were behind in the space race. Eisenhower threw in \$1 billion, which was a lot of money in those days. Johnson created NASA, and Kennedy challenged the country to put a man on the moon. By the way, Eisenhower also created the National Defense Education Act to try to stimulate interest in math and science. If you go back and look, the space race created the mainframe race, and mainframes got hotter as they got faster, so these three guys came in and started this company called Intel and replaced the ferrite-core magnets on the back of mainframes with DRAM. That started the semiconductor industry. They took DRAM technology and created the microprocessor. Meanwhile, DARPA [Advanced Defense Research Projects Agency] tied together supercomputers to create super supercomputers, and the by-product of that was the Internet. With the Internet, you got Yahoo! and eBay and Google. If you dissect that and try to figure out how much of that can happen again—we didn't even get back into the space race without the help of Werner von Braun, who used Redstone rockets that were used to fire missiles into London because our own missiles were blown up on the launch pad. Andy Grove came from Hungary. He'd be sent back today. 'Sorry Andy, visa denied.' Then, you've got Google founded by Sergei [Brin], eBay founded by Pierre [Omidyar], and Yahoo! founded by Jerry Yang. Not only could we not do it today, we didn't do it then. Not allowing the best and brightest to come into this country and help us advance our own cause is the wrong thing to do. And it's all in the name of the politicians thinking they're representing their constituencies. I don't think their constituencies think that way anymore. They all want to maintain the technology leadership. They don't understand why we're losing it and our politicians are doing nothing.

**Daane:** As the baby boomers retire, we will lose half of the engineers and the physical-science experts that we have in our work force today in the United States. We're




not replacing those individuals, so we are dependent on bringing foreign nationals into the United States. Otherwise, the jobs are going to go offshore. In EEs, if you look at advanced degrees, 50% of the master's students and 70% of the PhDs are foreign nationals. We're bringing people in, educating them in our best universities, and, instead of keeping them here, we're sending them home to compete with us. We're fundamentally at a point where the United States is pushing jobs offshore, not trying to keep them here to replace the workers that will be retiring in the next 10 to 15 years.

**Meyerson:** I think it's worse than that. The reality has set in throughout the rest of the world that these are precious skills. You go to China and look around at the universities. I've given talks there. In the United States, the talk would draw 100 attendees. They'll fill an auditorium of 5000 people. This has become a matter of national

network analyzer as a donation. It was \$110,000. The professors would horde it, wheel it from lab to lab, and they had to sign up for it four days in advance. The professors goes to China—Xinhua University—and, after his speech, they give him a tour. He notices that, in every single lab, they have an Agilent network analyzer. Most of them had never been turned on or plugged in, but they're there when they're needed. Now, back to Fishkill. The whole technology race that let the DRAMs run cooler and faster came from the transistor invented by Bell Labs in 1947. Where's Bell Labs? Where's Xerox PARC [Palo Alto Research Center]? Where is SRI [Stanford Research Institute]? Where is the Watson Lab? In our infinite wisdom, we haven't let anyone get big enough to afford that.

**Vallee:** The issue of H1-B visas is about the talent pool and technical capabilities. I also question what's going on from an economics perspective. While we are cranking up Sarbanes-Oxley in America, making it more difficult and more costly for businesses to survive here, it is much easier and more cost-effective to survive elsewhere. If you look at corporate tax rates in other countries and the United States, and then take it down to the individual level, the taxation on stock options and the appreciation for stock-based compensation, here it is becoming a dirty word, and there it is the way forward. You apply yourself, you work hard, you create value in the form of products and services, and in return you get rewarded for that economically. In addition to this whole technical shortage issue, we've got an economics issue where the United States is becoming noncompetitive on a global stage.



**As the baby boomers retire, we will lose half of the engineers and the physical-science experts that we have in our work force today in the United States.**

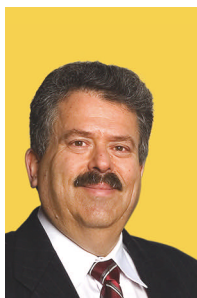
— John Daane, President and CEO, Altera

pride and honor. They attract back the best and the brightest to form the leadership that is the core nuclei of companies. They define them as 'national treasures.' It's understood elsewhere where the value is. And, by the way, it doesn't have to be that way. In Fishkill [NY], we have the United Nations of technology. We have Samsung from Korea, AMD with their folks from Dresden, Sony and Toshiba, Chartered from Singapore—you can create a nucleus that has enough technical clout so that people will come, and they will stay because it's the best of breed. The trouble is that other companies have also figured out that trick. We're not working hard enough here to keep it. It's painful.

**Halla:** And, by the way, we're getting fewer and fewer applicants into the master's and PhD programs because they know their chances of staying here are significantly reduced. So they're going to the University of London and the University of Singapore. Our universities are being underfunded by DARPA and the NSF [National Science Foundation], and the people that used to pay full fare are not coming here. A professor at Harvard and Berkeley was speaking in China. They received an Agilent

**Q: You're the leaders of the electronics industry. How do you solve this problem?**

**Halla:** If you look at what's happened over the past year and a half, every technology industry association, whether it's the National Academy of Sciences or the AEA [American Electronics Association] or the Semiconductor Industry Association, they all published white papers. All those white papers called for the same things from politicians: Eliminate the H1-B visa cap altogether and increase the funding for basic research. I'm not talking about the amount paid for Hurricane Katrina or the bird flu. I'm talking about a fraction of that. All these white papers said the same thing. The Democrats jumped on it and they came out with the Innovation Agenda after visiting the Bay Area, Boston, Texas, and Arizona. The Innovation Agenda called for all the same things with the addition of independence from the Middle East on oil. The Republicans immediately responded with PACE [Protect America's Competitive Edge]. Then, the president wisely picked it up and put it in his State of the Union speech and called it the American Competitiveness Initiative. Now we have 100% agreement. You know how much got done



**The complexity of the technology we're generating is almost mind-numbing.**

— Bernard Meyerson, VP and Chief Technologist, IBM

by the 109th Congress? Nothing. H1-B visas turned into an 800-mile fence on the southern border of the United States to keep out illegal immigrants. I don't think our politicians represent their constituencies anymore. It's the great debate. They've lost their roots.

**Q: What about government-supported research organizations, such as IMEC [Interuniversity Microelectronics Center] in Belgium?**

**Meyerson:** Although it's a very good quality effort, it isn't an integrated effort. The problem nowadays is the complexity of the technology we're generating is almost mind-numbing. Unless you can do an integrated result where you can validate that all the materials behave as expected at the native dimensions where they're going to be utilized, you don't know if you have the answer. You can't do that at a place like IMEC. It also doesn't have the mindset, in my experience, to drive hard enough. It's a good start, but it's not the answer.

**Rhines:** We do have massive cooperative efforts. The GRC [Gordon Research Conferences], SEMATECH [Semiconductor Manufacturing Technology]—many of these are of the same ilk as IMEC, and they put resources together where they can test results. But, even more so, in the free market, we have alliances being put together. There is the IBM alliance associated with process technology and the activity of companies trying to get standardization on design rules for building designs in different foundries. All of these things work in getting economies of scale the same as IMEC works for the economy of scale for pooled R&D in a single operation.

**Halla:** But IMEC is more precompetitive.

**Rhines:** SRC [Semiconductor Research Corp] is a precompetitive institution in the United States. GRC is precompetitive. SEMATECH has been precompetitive. So, we do have precompetitive groups in the United States.

**Q: The universities in the United States appear to be much closer to the commercialization stage, though, if you look at schools like Berkeley,**

**Stanford, and Georgia Tech. Is that right?**

**Rhines:** Funding for the physical sciences from the government has been in steady decline in favor of funding for Homeland Security, the NIH [National Institutes of Health], and biosciences. The institutions in the United States have to survive in a more competitive funding environment with a great degree of their funding coming from industry as opposed to ARPA [Advanced Research Projects Agency], DARPA, and grants.

**Halla:** It's a quicker payback on the funding that they're looking for. If you want an 18-month payback, that's anything but basic research. That's D [development], not R [research].

**Maier:** The challenge US companies have is not a matter of individual issues. It's the additive effect of all of them. It's Sarbanes-Oxley, H1-B, predatory litigation—all of those things add up to a very difficult competitive landscape. That's why you find companies moving most of their operations outside the United States. It's the complexity of doing business at the city, state, and country level. For all of us here, we have operations around the world. You can compare what it's like doing business in Singapore versus the United States. It's a probusiness environment.

**Halla:** At the end of the day, this country is still the IQ magnet. It's been well-articulated what has to happen.

**Q: What effect will private equity have on the electronics industry?**

**Halla:** If you just take Freescale as an example, if you were Delphi, you would wonder whether they're putting everything they can into R&D for the next generation of technology and the one after that—or whether they're cleaning up their books and trimming their balance sheet for that eventual re-IPO [initial public offering].

**Maier:** I think there's a genuine concern among the customer base that companies that engage in private equity will reduce their development efforts and lose their direction in regard to providing innovation for customers. I visit customers all the time, and one of the questions they've never asked me before is: 'Have you guys been approached by a private equity firm?' They're concerned about whether you're going to trade the longer view, investing in your technology and your products, versus trying to drive the company to some payday a few years in the future. That's a big concern for this industry.

**Truchard:** In 2001, when we had the big downturn, everyone in our industry cut back and laid people off. We doubled our R&D staff over the next four years. That proved to be a very wise decision. But I don't think I





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could have made that decision if I weren't a major shareholder. I could tell the investors on Wall Street that I was going to double down and invest in R&D. Companies that did those cuts find themselves without the latest technology and not able to compete as effectively as they could have if they had continued to invest in R&D.

**Q: That sounds like a dilemma. If you're a public company, your shareholders won't allow you to invest in R&D. And if you're bought by a private equity firm, they're going to convert all your revenue into debt service.**

**Halla:** No. I think the shareholders will support R&D. Our shareholders are always asking us if our R&D spending is enough.

**Truchard:** CEOs have to have the guts to tell shareholders that this is what it's going to take to get the right end result.

**Meyerson:** I think you need to decouple R from D. I've been able to predict fairly accurately which companies would exit technology by just looking at the R investment. It's a long pipeline, and that's something our government doesn't realize. You're talking about a 10- to 20-year horizon for a lot of the R that becomes D and feeds the pipe. What worries me is: We don't have an appreciation of making those investments. We've been incredibly fortunate in our case because the State of New York—for whatever reasons, whether it was great insight or wanting to put jobs in the Hudson Valley—they've invested an astonishing sum of money in Albany. At that time, it had nothing. And they build an R center. Don't confuse it with D. We're talking 45-, 32- and 22-nm technologies, ultraviolet, and all of that. It is such a rare thing nowadays, though, to see people put money in the R side. We've gotten comfortable with R&D being one word. My background as a hard-core physicist tells me that R&D are not the same thing. We easily kill the R because the shareholder will not see the negative consequences for five to 10 years—by which time the person who killed the R is long gone. If I have one contribution, I'd like us to make, it's separating those words. That's why you don't have people in the universities pushing the frontier anymore. In Watson, we still have a crew of people who do this. But the demise of Bell Labs was a nightmare for us. They kept us honest. There was a huge battle back and forth. It drove all of us. Now, we don't have Sarnoff or Bell. When the R dies, you can hide it for a long time—until the D collapses.

**Q: Wasn't one of the drivers back then the fact that Bell Labs didn't enforce the patents on the transistor?**

**Rhines:** It's a little different from that. What they did in 1947 was offer an open license, which leveled the playing field by licensing 50 companies. Those 50 companies went off and developed semiconductor technology. Because they had been on a level playing field, they now freely cross-licensed each other. It was accompanied by a legislative environment that had no circuit of appeals for federal patents, so royalties were at a very minimal level—less than 1% in the most successful case. Companies found it better to cross-license, and this created the most innovative period in history because patents were pulled out of the equation. Without patents, everyone could stand on everyone else's shoulders, and we had innovation like we had never seen before. What we have



**The challenge US companies have is not a matter of individual issues. It's the additive effect of all of them.**

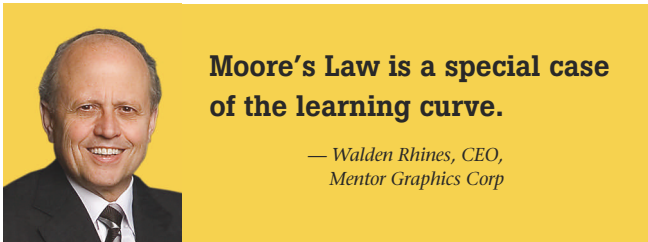
—Lothar Maier, CEO,  
Linear Technology

now is litigation, torts, and all sorts of other things. Principally, it's for the purpose of protecting those who have stopped innovating and allowing them to enforce or collect money for innovations that were done years ago. That has certainly made it more difficult for innovative companies to pop up and for innovative people to get their ideas into the market.

**Meyerson:** We have one of the biggest patent portfolios out there. When you're faced with a patent troll, you have exactly two choices. One is that you have patented and protected every imaginable aspect of what you do to run your business, or you pay an unbelievable penalty to that troll because they find the one chink in your armor.

**Halla:** And there's nothing you can countersue them for.

**Meyerson:** Yes, because they have generated nothing of value. They will never generate anything of value, as humans or businessmen. When you're our size, you have those two choices. And you're right, it's a huge inhibitor. We've tried ways of addressing it. We've opened up a huge amount of our portfolio in software where people can essentially protect themselves by operating under that enormous armament that we put out there as an umbrella to at least drive innovation in a field that was becoming crippled. But it's going to take legislative change. We cannot afford to cover every iota of space



that we work in. It's crippling. It burns up an immense amount of time in a useless pursuit.

**Q: What about start-up companies? They don't enter the world anymore to be companies that can grow up and build a product. They have an exit strategy when they're first funded.**

**Halla:** The exit strategy is to be acquired by somebody else. But I don't think anyone begrudges the start-up. I would never call it basic R, but it definitely contributes in a big way.

**Rhines:** The thing that distinguished the United States in the growth period of the 1990s was the ability to attract capital for new innovation. In the early 1990s, more than 90% of the equity funding was coming through the United States. Now, it's the other way around. Less than 20% is coming through the United States. We have new markets like London and many of those in Asia doing all the fund raising. Some of it is due to Sarbanes-Oxley, some of it is tort litigation, but the end result is that capital no longer predominantly flows through the United States. That could be changed through the legal infrastructure or through tort reform. There are lots of things you can do to improve that environment.

**Q: Is it feasible for companies to get together and follow IBM's model and create technology umbrellas?**

**Meyerson:** There's no rule that says you can't take your technology, pool it and operate under a protective umbrella. We built the equivalent of a shield. If you want to be a start-up in the software industry, that's one way to operate cleanly. But I don't know if people are comfortable yet putting that much of their assets on the table. That's not a little thing to give up. But we can't continue the way we are because it will crush the start-ups. I'm a fan of start-ups. They are the soul of this industry. They're just unfortunately in an economic trap where their exit strategies have had to change. But the innovation they drive is astonishing, and they live to innovate. We can't allow that to be crippled for the sake of this country. One of my favorites is Intersil when Greg Williams spun out of Harris,

and 802.11 was a joke. There were a handful of cards out there. A few years later there were hundreds of millions floating around the planet. Effectively, it was a start-up.

**Q: So, if someone has a bright idea these days, they should move to China?**

**Halla:** China has a whole program to make it easy for people kicked out of the United States to come to China. In their 11th Five-Year Plan, the word 'innovation' is mentioned 581 times. They are desperate to have what we are losing.

**Q: Another element of this is the cost to stay on the Moore's Law road map. Can companies do it alone, or can it only be done as part of a consortium?**

**Rhines:** Moore's Law is a special case of the learning curve. Through shrinking feature size and increasing wafer diameter, we achieved all the cost reduction required to stay on the learning curve for almost 40 years. We will continue to reduce the cost per function out into the future, but it won't be so easy as just reducing feature sizes and increasing wafer diameters. We've got to innovate in other areas, but it will happen. That means 3D structures, packaging, and all sorts of things you can do to achieve the same result.

**Meyerson:** Moore's Law has become almost an afterthought. In commodity, if you're just going to build DRAM or something else that's well-defined and we already know how to do, it's highly applicable. In the real world of systems, the expectation of a customer in IT is about 90% annual growth rate in function, of which you're getting about 15% from the semiconductor. So, you already know it's in the noise. It's a round-off error in terms of what's happening, and there are good examples where, generation to generation, we've driven by design factors of 10 or 100 times in various attributes, and the technology was back-level. At the level of the product, it's much more complicated than technology. It's necessary but not remotely efficient. Moore's Law has been a godsend in driving down the raw-material costs, but the raw materials are the chips and the micros and the memory. When you start getting to system-level integration, you can have a handheld GPS [global-positioning system] that goes anywhere in the United States and has a listing of every restaurant within 5000 miles of where you're standing. And it fits in your hand and costs you \$400 retail. If you think about what's in there, it's a lot more than the chip set.

**Daane:** Moore's Law is technically alive. I think the problem people are facing is that economically it's an issue.



# Apple TV moves video using 802.11n Wi-Fi

By Maury Wright

**A**lthough our annual *Movers and Shakers* issue infers a focus on people and companies, technologies move and shake, as well—none more so than 802.11n wireless-LAN technology and digital video. Wi-Fi, in its various flavors, has long promised to deliver digital video around a home, and Apple is the first major player to ship a consumer product—Apple TV—that leverages Wi-Fi for video distribution. But it's the draft-standard 802.11n technology that's the real mover.

For those that haven't heard, Apple TV is somewhat like an iPod for your living room, although a networked DVR may be a better description. The device can play iTunes audio and video from networked Macs and PCs,



Apple TV leverages Wi-Fi for video distribution.

Courtesy of Apple as well as other multimedia content stored on the home network. The integrated draft-compliant IEEE 802.11n wireless-LAN interface or Ethernet connects Apple TV to the home network, and most consumers will likely prefer the wireless link.

Apple is fairly particular about IC suppliers not boasting about winning sockets in Apple products. In the case of Apple TV for instance, Broadcom hasn't promoted the fact that its Intensi-fi dual-band draft-compliant chip set is in the product. But several Apple TV disassemblies you can easily find on the Web, such as [www.anandtech.com/mac/showdoc.aspx?i=2951&p=1](http://www.anandtech.com/mac/showdoc.aspx?i=2951&p=1), show the wireless card to carry the Broadcom BCM9432 1MC model number.

Although Airgo Networks (now a part of Qualcomm) pioneered the spatial-multiplexing MIMO (multiple-input-multiple-output) technology that's arguably the biggest advancement in 802.11, Broadcom is the market leader in draft-compliant 802.11n product shipment. And, although Airgo concentrated on enhancements to 802.11g in the 2.4-GHz band, Broadcom has pursued an architecture that supports both the 2.4- and the 5-GHz bands.

Note that neither the 802.11n spec nor the Wi-Fi Alliance ([www.wi-fi.com](http://www.wi-fi.com)) mandates that products support both bands. Bill Bunch, Broadcom director of product management for wireless LANs, believes the dual-band approach will be especially important in video products. He states, "A lot of the OEMs are headed that way. They want the most flexibility with respect to channels."

As Bunch correctly points out, the 2.4-GHz band is increasingly crowded and that band offers only three nonoverlapping channels. It will be key for video-enabled products to find clear spectrum to successfully transmit the rich stream. The Broadcom implementation in the 5-GHz band offers 24 nonoverlapping channels to complement the 2.4-GHz channels.

In all fairness, Apple TV addresses a much simpler problem than, say, telecom or cable companies face in trying to stream real-time HDTV content over Wi-Fi. Apple TV does work more like a DVR, storing content on a local disk. The transmission need not happen in real time to keep consumers happy.

Still, it looks as if 802.11n will support streaming operations, as well. Recently the trio of STMicroelectronics, Metalink, and Samsung announced plans for 802.11n-enabled set-top boxes for IPTV (Internet Protocol TV) applications.

Long a leader in supplying to the set-top box, STMicroelectronics ([www.st.com](http://www.st.com)) will provide the STi7109 high-definition video decoder. Relative newcomer Metalink will supply the 802.11n WLANPlus chip set. From inception, Metalink has concentrated more on embedded-system applications, such as set-top boxes, rather than the crowded PC market. Like the Apple TV 802.11 implementation, the Metalink design will relay on the 5-GHz band, and the company claims that the design will send streams over distances of 100 ft or more with full quality of service.

Samsung is not well-known as a set-top-box vendor in North America. But, according to ABI Research, Samsung is the second-leading set-top-box vendor worldwide and the leading vendor in the Asia Pacific region.

It's also worth noting that the video-over-802.11n activity appears to be gathering steam before the final 802.11 specification is ratified, although that milestone should come later this year. But certification from the Wi-Fi Alliance will come this summer, possibly as early as June. Broadcom's Bunch states, "I believe it's the Wi-Fi logo that gives consumers confidence."

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Maury Wright is editorial director of EDN.

# Lithium-ion-battery technology revives the electric car

By Margery Conner

**"A**t the end of the day, this transformation [from mechanical automobiles to vehicles that run on electricity] will be as important as the transition from horses to horsepower."—Rick Wagoner, General Motors chairman and chief executive officer, at The Greater Los Angeles Auto Show, Nov 29, 2006

Soaring gas prices, a desire within the United States to reduce reliance on foreign oil, and growing concerns about global warming have combined to whet the appetite of the traveling public for more fuel-efficient, cleaner-running cars. The weak link in environmentally friendly EVs (electric vehicles) and HEVs (hybrid-electric vehicles) is the battery. It's big, heavy, slow to charge and discharge, and potentially explosive.

But all of those issues are about to change: Recent advances in lithium-ion cells and battery packs are making EVs and HEVs feasible just when the general public is clamoring for them.

The popular Toyota Prius HEV uses its NiMH (nickel-metal-hydride) batteries only to assist the gas-powered engine—not as the vehicle's main power source: The car charges the battery from the engine's waste-power during deceleration and then uses the battery during acceleration. The NiMH batteries, although more efficient than lead acid, lack the energy capacity to power the larger Prius for a meaningful mileage between charges on their own.

Enter the lithium-ion cell, ubiquitous in consumer electronics, such as cell phones and laptops. Compared with lead-acid- and NiMH-battery technologies, lithium-ion batteries are lighter because of their higher energy density and can store enough energy in a battery pack to power a car.

The Tesla EV is not only conscious-salving green, but also neck-snappingly fast: It goes from 0 to 60 mph in 4 seconds and has a top speed of 130 mph. The distance between charges, the company claims, is more than 200 miles. While other car designers were scratching their heads about how to develop a lithium-ion battery suitable for a car, the Tesla design team took the ubiquitous 18650 lithium-ion cell—the same AA battery-sized cells in cell-phone and laptop battery packs—and packed 6800 of them into a 900-lb battery pack capable of powering the Tesla. The pack takes about three hours to charge.

Battery developers are feverishly working on improving lithium-battery technology. Cobasys/A123 and Johnson Controls/Saft both have announced battery-development contracts with GM for its newly announced

Volt plug-in HEV. (A plug-in hybrid uses the battery to provide power to the car's motor and uses its small internal combustion engine to recharge the battery when it exhausts its charge on long trips: The primary source for recharging the battery is a power outlet that you power the car into between trips.) A123 claims that its new



The Tesla sports car, powered by lithium-ion batteries, accelerates from 0 to 60 mph in 4 seconds and can go more than 200 miles between charges.

lithium-battery technology will allow battery recharging within 10 minutes, with none of the nasty explosive side effects that current lithium-ion cells can experience when you too aggressively charge them.

However, in addition to taking a long time to charge, current lithium-ion technology can't discharge rapidly, either, and thus it's not well-suited for powering a car during rapid acceleration. Enter a similar and complementary technology: ultracapacitors. John Miller, PhD, vice president of advanced transportation systems for ultracapacitor manufacturer Maxwell Technologies, suggests that EV and HEV cars will begin using a battery pack that combines an ultracapacitor with a traditional battery, such as a lithium derivative. Each component will do what it does best depending on whether the car is stopping and starting or cruising on the highway.

Regardless of what form the battery pack takes, semiconductor companies will win big in the new automotive EV and HEV world. Analog- and mixed-signal companies that have seen profits soar based on their power control and switching product lines are well-positioned to watch the automotive industry shift to electric cars.

Margery Conner is a technical editor at EDN.

# Telemedical electronics pave the way for personal medicine

By Robert Cravotta

Imagine a world in which people on different continents see the same medical specialist on the same day. The miniaturization of electronic components is combining with increasing integration to all kinds of networks and is radically changing how the medical community diagnoses, treats, and monitors patients and their medical conditions. These changes will affect everything from the effectiveness of high-end imaging diagnostic equipment to how practitioners interpret the results and apply them to patients.

The timing couldn't be better. According to the World Health Organization ([www.who.int](http://www.who.int)), there were 600 million people aged 60 and older in 2000. The organization



Telemedical electronics connect medical professionals and their patients.

expects that number to reach 1.2 billion by 2025 and 2 billion by 2050 (Reference 1). The opportunities for personal medical care that follow the patient continue to reach a wider portion of the population each day.

Part of the change will become apparent in smaller, faster, and cheaper medical equipment. The same dynamics that have driven down prices in consumer electronics now apply to medical equipment. Miniaturization, better integration, and global competition are having a direct impact on the cost of medical equipment in the home and in hospitals.

Developing medical equipment is a long-leadtime endeavor, and many semiconductor companies until recently were reluctant to broadly target the medical design community because of liability fears. Doug Raptor, vice president and manager of worldwide strategic marketing at Texas Instruments, points out, "Over the last year, we made a deliberate effort to investigate and separate the fact from the fiction with regard to liability for supporting medical equipment." Microchip now supports a Design Center for medical applications. Texas Instruments' medical-application-support pages include block diagrams for types of medical devices.

These companies recognize that they can target their components to medical applications because the onus of medical liabilities falls mainly on the end integrator of a medical device. This scenario is similar to that in the automotive, military, and aerospace-equipment markets, in which designers rely on fault tolerance at the system level to meet the quality and safety requirements for their products.

The trend toward shorter hospital stays, meanwhile, is helping to drive the emergence of portable patient monitors. Those devices enable patients to recover at home without incurring unnecessary risks because they can notify the patient and report back to the hospital when there is a high-risk condition. Portable devices that can communicate with a central office, meanwhile, are empowering patients to better manage their own health. By using programmable processors, patients and doctors can dynamically tailor to the devices' rules for monitoring, alerting, and taking direct action. For example, the devices can give a dosage of medicine to a patient or alert emergency workers. Tailoring to the individual rather than a section of the population.

A lack of interoperability standards is currently hampering the realization of telehealth-care—medical equipment that connects to and uses a network. These standards address the safe use of medical devices over ubiquitous networks. Despite multiple networking ports on medical equipment in hospitals, those connections sometimes are unusable because hospital buildings do not support those networks.

Organizations such as the Continua Health Alliance ([www.continuaalliance.org](http://www.continuaalliance.org)) are considering wireless-network-connectivity standards, such as Bluetooth, Wi-Fi, Z-Wave and ZigBee, to promote interoperability between devices and data collection centers. The Continua Health Alliance consists of end-equipment manufacturers, such as Medtronic, and semiconductor companies, such as Motorola, working to establish of connectivity standards for medical equipment to enable interoperable devices and services.

The next time you're sick, you may be able to stay home and still see the doctor—no matter the distance.

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*Robert Cravotta is a technical editor for EDN.*



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# Emerging-country markets shake tech's assumptions

By Ron Wilson

To see emerging markets in action, take a close look at just one product category: the ultralow-cost cell-phone handset. "The market for low-cost handsets in emerging economies is no longer speculative," insists Qualcomm's senior director of product management, Reiner Klement. "Individuals in these markets clearly have enough disposable income to support service providers and pay for phones."

The same message comes from Horst Pratsch, vice president of marketing for entry-level phones at Infineon. "In the developing world, system operators are providing subsidized phones to their customers and making margins on \$5 a month in billings," he says.

This reality may have come as a surprise not only to marketing managers in developed countries, but also to service providers in developing countries. Pratsch says that, in many cases, service providers first establish networks in dense urban areas to serve wealthy custom-

themselves can make money. Because the operators will be subsidizing the phone, they want to spend money only on handset features that will bring them either more subscribers or increased revenue per subscriber.

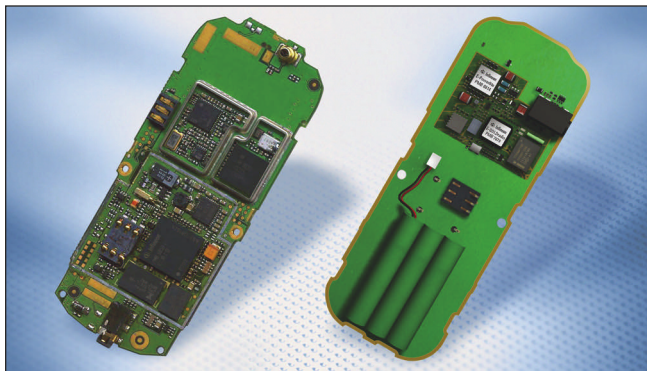
In rural areas, where there is little competition among service providers and little experience with any kind of personal electronics, that means bare-bones phones. AAA batteries may be the best power source simply because there is nothing into which to plug a charger. Monochrome displays may be adequate. "These handsets are taking off as operators move outside the cities into the rural markets," Pratsch says.

But low-end urban customers are a different matter. Here, living next to the Joneses and down the street from the genuinely wealthy has already transformed the handset into a personal statement. Merely having one is no longer a status symbol. Having a new ring tone this month, or taking pictures of the kids and sending them to a relative is a status symbol. So, style and features are important in some still-low-cost markets.

"We see an emerging minimum acceptable feature set," Klement says. "Just voice calls, black-and-white displays, and AAA batteries are not appealing to these customers in the second wave. For example, in India and China, operators now want moderate-speed data service to provide ring-tone and music downloads."

"In China, you see locally designed handsets with all the features of midlevel brand-name feature phones. But they use chips from local vendors. They are much less expensive than their branded counterparts, but they tend to have software and even hardware bugs," says Juan-Antonio Carballo, general partner at Argon Venture Partners. "This [point] is now the entry level in China."

So how do you reach ultralow cost if you are an Infineon or a Qualcomm? You slash parts count through integration. Both companies' reference designs include a single SOC (system on chip) that integrates baseband, applications processing, memory, analog audio, power management, and even small-signal RF circuitry. In addition, both designs take measures to reduce the number of external passive components—from typically 250 two years ago to about 50 in the latest designs. An equal amount of work goes into reducing the memory footprint of applications. All this shrinkage adds up to bill-of-materials, assembly, and test savings.



A previous GSM mobile phone has SMS features and approximately 150 to 200 electronic components (left). An ultralow-cost mobile phone with Infineon's ULC platform has fewer than 100 electronic components (right).

ers. Only later did they turn to ultralow-cost handsets to produce revenue from the unused network capacity and the millions of unserved people within the network infrastructure. Deploying base stations in rural areas has been an even later development.

So, what do these new customers want in their handsets? The reality is interesting and, at first glance, confusing. There is a market for absolute bare-bones handsets powered by AAA batteries. There is also a demand for feature-phones with considerably wider capabilities.

In most countries, the system operators define the market. They understand better than anyone else what their customers want and—just as important—how they

*Ron Wilson is executive editor at EDN.*



# Appliances start saving energy as population grows

By Paul Rako

The population of earth uses 13.5 TW of energy per year. But if the entire population of the world used energy at the same rate as US citizens, we would need 76 TW (*Reference 1*). And that's just the beginning. In 2050, when the population reaches a projected 9 billion, we would need 102 TW. There are alternatives, of course. If we turned all the food in the world to biofuel, we could get 7 to 10 TW of energy, but we would have nothing to eat. Nuclear power could supply 8 TW if we build 8000 new reactors. And wind power would generate 2 TW if we paved the earth with windmills everywhere the wind blows at 11.5 miles per hour 33 feet off the ground.

Although we no doubt will need additional energy production, the future points squarely to energy conservation. Converting appliance motors from hard-wired to ac-inverter-driven can save 20% of the energy used. Converting to a brushless-dc motor and drive can save another 20%.

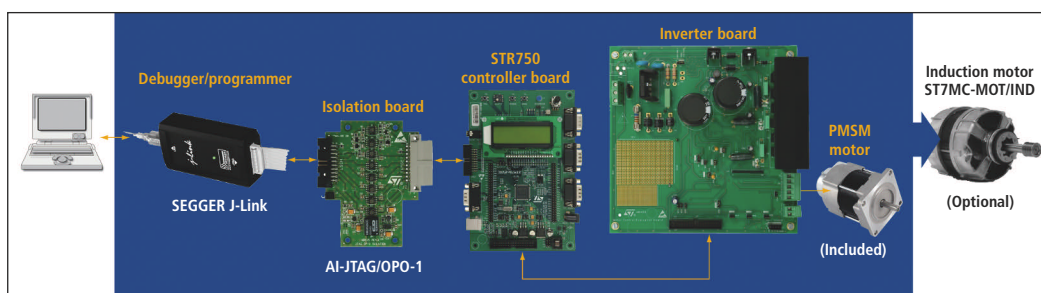
The remarkable thing about converting to a more sophisticated motor system is that manufacturers can do it at no cost penalty to the consumer. Air conditioners will have variable-speed motors so they can save as much electricity in the first year as any incremental cost increase. In washing machines eliminating the belt drive and transmission more than pays for the cost of the electronic drive. In addition to lower price, the machine will have software-defined agitation, use less water, and operate far more quietly than currently available machines.

"We can save more than 60% of the energy consumed by washing clothes," says Alex Lidow, chief executive officer of International Rectifier, noting that electronically commutated brushless-dc motors can also save 60% of the energy that refrigerators and air conditioners consume (*Reference 2*). Converting to efficient motor controls in all appliances would save 20% of the world's energy use, or about \$14.5 billion.

Thomas Hopkins, director of applications for STMicroelectronics, says "ST has a broad product line that covers the digital control in parts like the ST7FMC and ARM-based STR750 to the L6385 and L6386 half-bridge

gate-driver ICs." He adds that ST is offering a complete motion-control demo board that even includes the motor (**Figure 1**).

Fairchild Semiconductor, meanwhile, is leveraging its leadership in power FETs and controllers to address this market. Taehoon Kim, PhD, the vice president overseeing Fairchild's high-voltage segment, says that integrating IG-



**Figure 1** STMicrosystems offers the STR750 motor-control-starter kit (STR750-MCKIT), which includes even the motor.

BTs (insulated-gate bipolar transistors) into smart power modules along with the circuits to drive the transistors creates a part with thermal and performance advantages.

International Rectifier is taking system integration one step further. The company's iMotion integrated design platform combines the microcontroller with a specialized motion-control digital engine. This digital section is far more application-specific than a general-purpose DSP. The platform also integrates the analog-drive circuits. In addition, the platform features modules for PFC front ends as well as the large IGBT power stages.

Energy conservation will be critical to the prosperity and comfort for the entire world. As Mark Thompson, president and chief executive officer of Fairchild, says: "We are excited by this as a business opportunity, but we feel a great obligation to whatever we can to make this planet a better place to live." In the future, it may take less energy to do just that.

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Paul Rako is a technical editor at EDN.



# Windows Vista: ambiguous bounty for hardware providers

By Brian Dipert

**A**fter five and a half years of development, Microsoft released Vista to manufacturing on Nov 1, 2006. Like all other operating-system releases of this magnitude, reaction from the outset was mixed, and it will continue to be for the foreseeable future. In the business world, cautious IT departments will first focus on testing backward compatibility and system requirements, delaying its adoption for months or even years.

In the upgrade market, acceptance is also slow so far, in no small part because comprehensive driver support remains elusive. In the consumer market, though, Vista almost immediately found a home, because, within a month after the Jan 30, 2007, Vista consumer intro, it proved difficult to find a Windows XP-equipped system for sale either online or in a brick-and-mortar retailer.

DRAM companies, in particular, are big winners in the XP-to-Vista transition. Microsoft's Web site indicates that Windows XP Professional requires at least 128 Mbytes of DRAM to run with adequate performance, but most OEMs wisely include at least twice that amount.

Compare even 256 Mbytes for XP with Vista's base requirement of 512 Mbytes, and it's easy to see why DRAM suppliers are celebrating. And the eye-catching Aero interface in Vista's premium flavors, which currently dominate retail, demand a minimum of 1 Gbyte of system DRAM. Part of the reason for the Aero-inclusive memory uptick is the corresponding necessity for a 128-Mbyte graphics-frame buffer. Systems that integrate the graphics processor within the core-logic chip set employ a portion of system memory as the frame buffer. In other cases, the system will include a stand-alone GPU for performance and image-quality reasons. Its 128-Mbyte frame buffer also

will be stand-alone—that is, incremental to the 1-Gbyte of system memory—and it will be implemented using high-speed, boutique (read: expensive and profitable-to-supplier) graphics DRAM. The benefit of the XP-to-Vista transition to GPU suppliers is less evident. Support is widespread for the required DirectX 9 API, and for Pixel Shader 2.0 and 32 bit-per-pixel features.

Vista upgraders likely will wait for GPUs that support the Vista-only DirectX 10 API. For users to view premium content, all Vista-targeted graphics chips will need to support encrypted, content-protected interconnections to displays, as will the displays themselves. Display man-

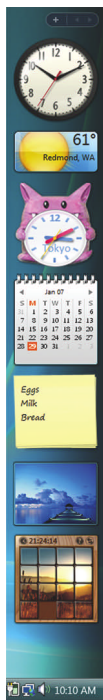
ufacturers should expect a notable uptick in demand for models offering HDCP-inclusive DVI and HDMI ports, as consumers unhappily discover that their current screens don't encompass Vista DRM support.

The outlook for hard-drive suppliers is mixed. Vista Premium requirements spell out the need for at least a 40-Gbyte hard drive, a capacity so small that some 3.5-in.-hard-disk-drive suppliers don't even offer it anymore. However, with Windows XP, the Media Center support for television recording and playback required a distinct version of the operating system that was generally unavailable for stand-alone purchase. Both the Vista Home Premium and Ultimate have built-in Media Center support. With NTSC and ATSC receivers in both USB and add-in card variants widely available for less than \$100 and keeping in mind the substantial storage requirements of video, especially high-definition video, content, hard-disk-drive suppliers may see healthy demand for their larger drive flavors.

Audio-chip and card suppliers are perhaps the big losers of the Vista era, which extends a CPU-centric sound-processing trend that began when Intel and Microsoft unveiled the AC'97 specification. As ExtremeTech author Loyd Case sees it, "Microsoft has completely rewritten the audio stack from the ground up, now calling the entire Vista audio subsystem the UAA. The key API stack is WASAPI. All Windows audio—including DirectSound—will layer on top of WASAPI. The major impact currently is the lack of support for [native] hardware acceleration in WASAPI."

And what of the CPUs themselves? Windows XP already supports such multicore-friendly features as multitasking between applications and processes, and multithreading within an application or process, so Windows Vista won't be a big incremental win for x86 suppliers. However, AMD in particular will benefit from Vista's improved support for NUMA. AMD processors embed system DRAM controllers on the die, one per CPU core, whereas Intel processors continue to rely on sharing the core of a common memory controller residing in external core logic. A significant performance penalty will occur if, with Windows XP, one AMD CPU core needs to access system memory that the other core's DRAM controller handles. Windows Vista promises to tangibly reduce this latency.

*Brian Dipert is senior technical editor at EDN.*



# Standards for telecom finally come to fruition

By Warren Webb

Standards are coming to the fractured and often-proprietary telecom-equipment industry. The only question is when.

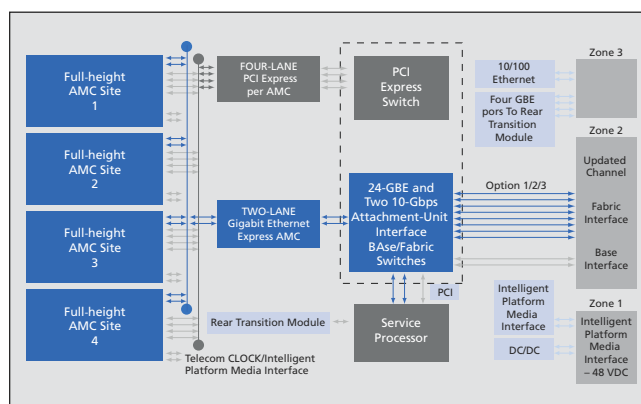
Uncertainty over a prevailing interconnect technology has slowed the arrival of standards to the telecom world. Telecom-equipment designers are transforming their industry from a hodgepodge of proprietary systems with long, expensive development cycles to standards-based designs that integrate low-cost, commercial off-the-shelf products. The first step in that process, defining a common open standard, is essentially complete with the adoption of the AdvancedTCA (Advanced Telecom Computing Architecture) specification. But the next step, filling the pipeline with a wide selection of low-cost, standards-based products, has run into a snag because board vendors are still debating the best high-bandwidth-interconnection strategy.

A standards-based development project reduces costs by incorporating off-the-shelf chassis, processor, and user-interface sections and reduces the design effort to unique hardware and the application-specific software. These designs also simplify the overall software development effort by providing access to compatible operating systems, vendor-supplied drivers, and sample firmware.

For the high-bandwidth applications in telecom, the industry has settled on some form of switched-fabric technology to eliminate many of the problems associated with traditional multidrop, shared-bus interconnections. With fabric architecture, high-speed point-to-point paths between computing nodes may change dynamically to support multiple simultaneous data transfers. A sophisticated switched-fabric system may also increase system availability by routing signals around defective paths.

System designers are betting on AdvancedTCA to deliver comprehensive board, backplane, and software specifications for the next generation of telecom equipment. Featuring a larger form factor, high-availability resources, and several switched-fabric alternatives, an AdvancedTCA backplane can scale to a capacity of 2.5 Tbps. The extra-large board supports all of the latest silicon and provides input power and cooling for as much as 200W per slot.

The AdvancedTCA specification features hot-swap capability for all boards and active modules, allowing systems to achieve and even exceed the elusive "five nines," or 99.999%, availability. A shelf-management element monitors the health, power, cooling, and even keying of plug-in modules to ensure that subsystems are operating efficiently. Modules get power from redundant -48V-dc power feeds and



The Motorola ATCA-C110 AMC carrier blade and plug-in mezzanine cards provide designers with multiple fabric-connectivity options.

data from redundant control and data planes to prevent a single failure from bringing down an entire chassis.

The basic AdvancedTCA specification defines a series of subsidiary specifications for backplane details of the various fabrics, such as Ethernet, Fibre Channel, InfiniBand, StarFabric, PCI Express, and Rapid IO. These options allow manufacturers to build conforming boards with any fabric technology, but they also create interoperability issues.

Most industry experts agree that open standards give designers the best shot at reducing system-development costs, yet critics claim that the current approval and adoption process offers too many design options, is subject to technical interpretation, and provides little confidence that products will work together. "The label 'industry standard' has lost its historic association with the characteristics 'mature and low risk,'" says Craig Lund, chief technology officer at Mercury Computer Systems. "Today, 'standard' really means 'formally documented and available for others to experiment with.'"

In an effort to ensure designers that off-the-shelf products from different vendors will work together, the Communications Platforms Trade Association recently released a set of interoperability requirements and test procedures. These documents give manufacturers the tools to certify interoperable open specifications-based products. "Testing and certification processes that facilitate multivendor interoperability are vitally important to network-equipment providers," says Todd Wynia, vice president of product management for Emerson Network Power.

Warren Webb is a technical editor at EDN.

# EDA jumps in to address power dilemma in handheld devices

By Michael Santarini

If you own a newer cell phone, iPod, Blackberry or similar handheld device, you may be wondering why the screen will go dark if you haven't used it for a few minutes. The answer is simple: power savings.

Solving the problem isn't so simple, though. Foundries and EDA vendors are diligently trying to help IC designers stretch battery life and add more features to next-generation handheld devices.

Synopsys Fellow Michael Keating points out that the ITRS (International Technology Roadmap for Semiconductors), which sets the direction for the electronics industry, recently pronounced that battery life for handheld devices had peaked in 2004 and is now going down. "We're adding more features, such as video, GPSs (global-

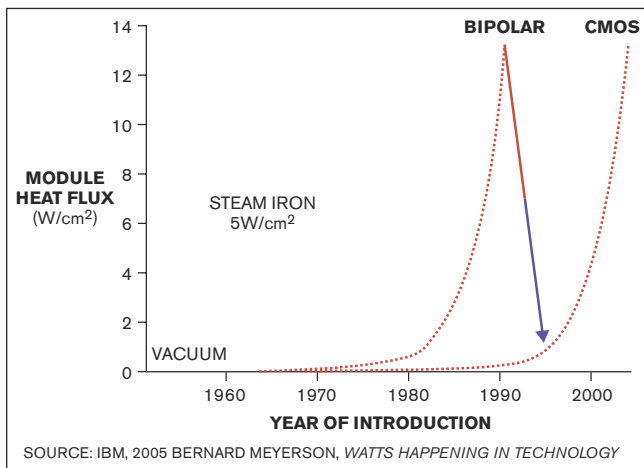
However, when semiconductor manufacturers began several years ago to manufacture ICs at the 130-nm process node, a nasty side effect—transistor leakage—reared its ugly head. In the race to make transistors so small and fast, transistors began to lose the ability to maintain power, and leaking transistors wasted a growing percentage of the power to the SOC. The problem became even more pronounced at the 90-nm node, and, when they reached the 65-nm process, IC manufacturers and EDA vendors started to mobilize to stem leakage. On certain high-performance processes, leakage caused as much as 60% of power consumption.

Foundries such as TSMC (Taiwan Semiconductor Manufacturing Co), UMC (United Microelectronics Corp), and the Chartered-IBM-Samsung Common Platform Alliance all have implemented new silicon elements, such as low-leakage transistors for noncritical functions.

Eric Filseth, vice president of the digital-IC implementation at Cadence Design Systems, notes that, in the early days of IC design, most designers developed chips on bipolar processes. The bipolar process hit a ceiling when the devices began to require too much power and produce too much heat. The industry then moved to lower power CMOS. "We're now seeing the same thing happen to CMOS, but, this time, we don't have another process to jump to so we have to deal with it in design," says Filseth.

Today, the EDA industry is trying to make entire design flows that are low-power-aware. Many believe the way to accomplish this task is for the entire industry to adopt a single low-power format that every tool in the flow can read. Unfortunately, the EDA industry is currently supporting one of two formats—CPF (Common Power Format), which Cadence created, and Accellera's UPF (Unified Power Format), which Cadence competitors Mentor Graphics and Synopsys back.

Cadence announced that practically its entire IC flow supports CPF, whereas Accellera has only recently approved UPF as its standard. Many in the EDA industry believe that the industry will eventually agree on one format. It may take some time, but in the meantime, a plethora of EDA vendors of all sizes are jumping in to help designers create feature-rich, low-power handheld products.



Bipolar processes consumed too much power and created too much heat, forcing the industry to move to CMOS. Now, CMOS is following suit.

positioning systems), and radios, to these devices to meet customer demands. Battery technology is improving, but not that rapidly, and so, in some sense, we're losing the battle," says Keating.

As manufacturers strive to pack more and more features such as video, MP3, Internet browsing, games and even GPSs into ever smaller and lighter handheld devices, they typically must implement most of those features in a single SOC (system on chip). But, to get all those features into one chip, most manufacturers have to create their SOCs using the newest silicon process. Besides offering more transistors, each new process has an added advantage in that it requires less voltage to power the chip.

Michael Santarini is senior editor at EDN.



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